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News of the Industry Begins Page 708

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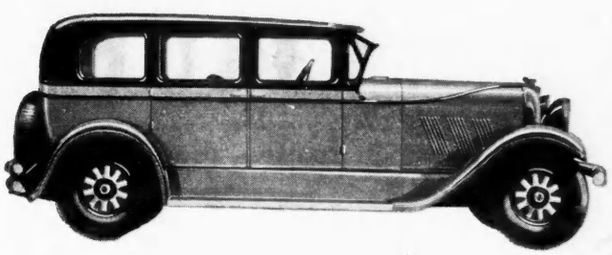

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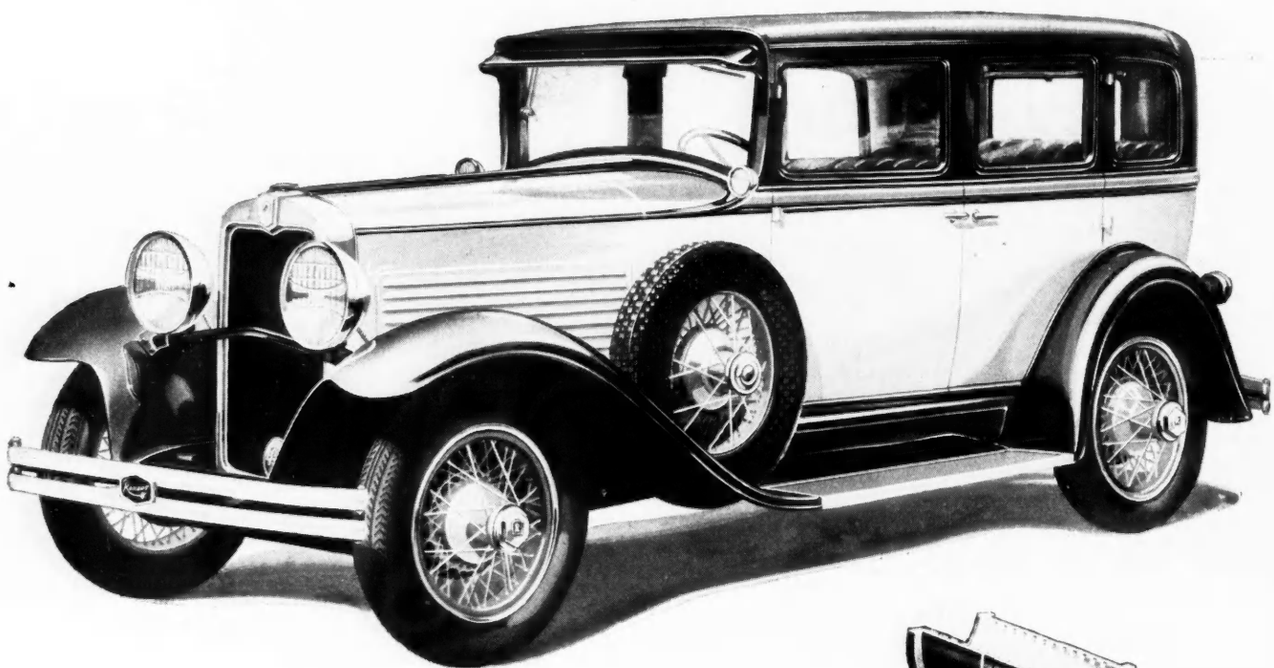

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The AUTOMOBILE

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Vol. 60 No. 18

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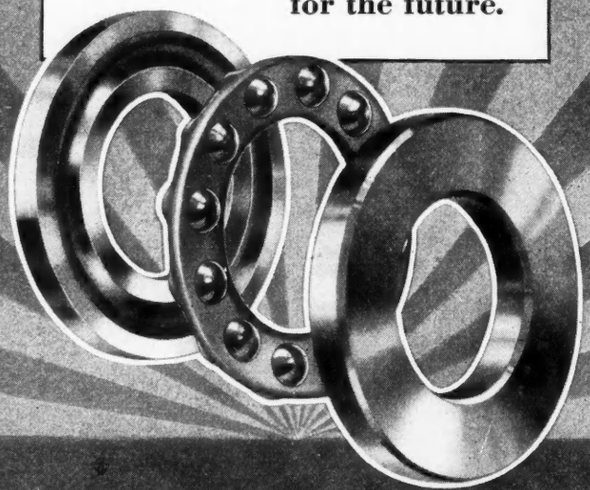

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CHICAGO, ILLINOIS

AUTOMOTIVE INDUSTRIES
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High Sales *Records This Month* Should *Take Up* Slack

May weather is expected to stimulate the automobile market to the point of overcoming declines reported for April from the Northwest, Pacific Coast and Southwest

By EARL O. EWAN

FAVORABLE weather, such as usually prevails in May, is expected to stimulate automobile sales this month to the point of overcoming the declines in April in that respect reported to *Automotive Industries* from several important centers of the country, particularly in the Northwest, on the Pacific Coast and in the Southwest.

These sales slumps were attributed mostly to generally adverse weather conditions, including cold, late snows and heavy rainfall. Automobile buying and ordering of exceptional volume was recorded almost all along the Atlantic seaboard from Atlanta to Boston. Inclement weather caused a slight letup at the southern port of New Orleans, northward at St. Louis and Cincinnati, and around the Great Lakes ports of Chicago and Cleveland.

New car stocks are estimated as being low in a few instances but mostly as normal for this season of the year, indicating that the record factory production rates have not overwhelmed distributors and dealers. Since most of the new car stock appraisals are made on the basis of an anticipated, rather than an actual, demand, it seems manifest that May must contribute very materially to the automotive sales columns to maintain the present pitch and tempo of the industry.

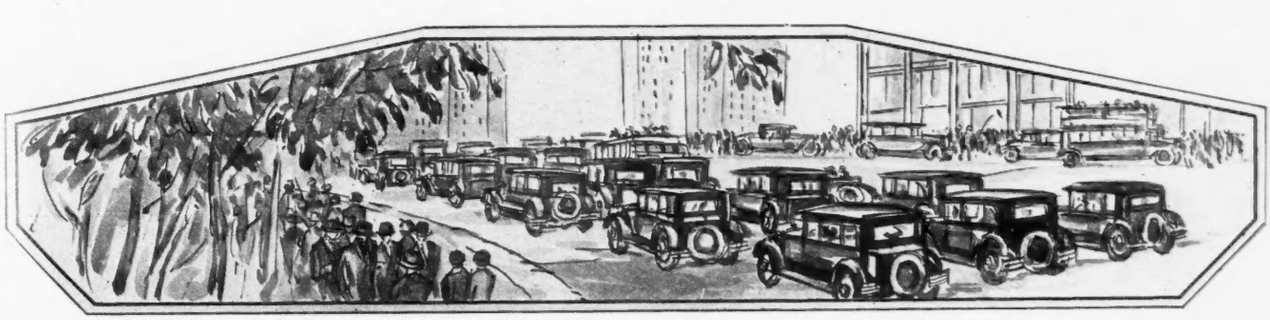
Even so, the usual prognostication is that production schedules must be curtailed, perhaps gradually, in this month, and surely not later than in June. That leaders of the industry are confident about conditions in general, however, is indicated by the predictions made in New York last week by Alfred P. Sloan, Jr., and Walter P. Chrysler in speaking at a luncheon given to the German Tax Commission by the National Automobile Chamber of Commerce at the Transportation Club. They said that the automobile factories would be kept busy on a growing production basis for many years to come by the demand in all parts of the world for motor transportation.

"Markets throughout the world are continually broadening," said Mr. Sloan. "Registration in other lands has now passed the 7,000,000 mark and will soon be supplying a regular replacement market, just as we now have in this country a demand for several million cars a year for replacement aside from new buyers."

"The major effort is not competition between companies or between nations," said Mr. Chrysler. "We are united in the effort of encouraging motor transportation in all countries through better highways and more reasonable taxation. This cooperative effort is bringing about a greater use of motor transport which will provide business enough for all."

Robert Kaufmann, chairman of the German commission, and Werner Feilchenfeld, official expert of that body, voiced the interest of Germany in motor transport promotion, and expressed the view that the time-saving value of motor travel would add mate-

(*Continued on page 714*)



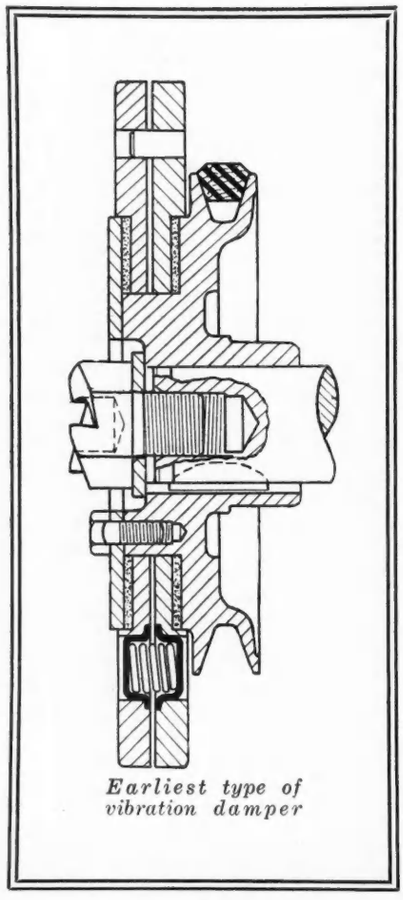
Controlling Torsional Vibration of by Dampers and Modifiers

Modification is possible by changing distribution of weight along the crankshaft, but increasing engine speeds require addition of dampers

EVER since crankshafts with more than four throws have been used in internal combustion engines, there has been a certain amount of trouble from torsional vibration. The flywheel at the rear end of the crankshaft forms a mass of considerable inertia, which cannot be accelerated rapidly unless tremendous forces are applied to it. On the other hand, a crankshaft with six or more throws is comparatively flexible, and every time an explosion occurs in one of the cylinders, the resulting large, sudden increase in the turning moment on the shaft has the effect of slightly twisting it. When the shaft is thus twisted, energy is stored up in it as in a spring, and after the force of the explosion has subsided, the crankshaft will snap back or unwind again, the same as a spring will rebound after being deflected by an impulse. And the same as a chassis spring, for instance, will be set in vibration, passing through a series of gradually decreasing deflections and rebounds, so the crankshaft will be set in torsional vibration by an explosion in one of the engine cylinders, and will swing back and forth a number of times until the vibration is stopped by damping effects.

Another factor which influences torsional vibration of the crankshaft is the natural period of the crankshaft assembly. A crankshaft of a given design, with masses of definite weight attached to it, can vibrate torsionally only at a certain definite rate, the same as a pendulum of a given length can swing only at a definite rate. The rate at which a crankshaft vibrates—that is, the number of complete cycles through which it passes per minute—increases with the stiffness of the shaft and decreases as the masses attached to the shaft and their distance from the axis of same increase. A large diameter, short shaft has a very high rate of vibration.

The tendency to cause torsional vibration of the crankshaft is present at all times as long as the engine is running and explosions are taking place in its cylinders, being substantially proportional to the maximum pressure attained in the cylinders. However, ordinarily no serious vibration of the crankshaft occurs. Assume, for instance, that the shaft has been deflected torsionally, or "wound up" by a first explosion, and is well on the rebound when a second explosion occurs. Then the spring force of the deflected shaft and the inertia of its masses are opposed to the force due to the new explosion, and instead of the vibration of the shaft being increased by the new explosion, it is stopped or at least reduced thereby. This is what occurs as long as the ratio between impulses (explosions) and the natural rate of vibration of the crankshaft is far from a simple fraction such as 1/1, ½, 1/3, ¼, etc. Under such conditions the crankshaft cannot be set into vibration that is serious or objectionable.



Earliest type of vibration damper

However, in the case of synchronism or near-synchronism between the vibration-producing impulses and the natural rate of vibration of the crank assembly, very violent vibration may occur. Assume that the crankshaft has been twisted or "wound up" by an explosion in one cylinder and has just completed the rebound, when an explosion in another cylinder takes place. Then the natural tendency of the shaft is to snap forward again, and this tendency, of course, is strengthened by the new explosion, so the angle through which the crankshaft is twisted by the second explosion is greater than that through which it was twisted by the first one, and each succeeding explosion will result in deflection of the crankshaft through a larger angle, until a limit is set by the damping (frictional) forces or by—breaking of the shaft. Such vibration is intolerable, and if it is likely to occur in any given design, means must be found to prevent it.

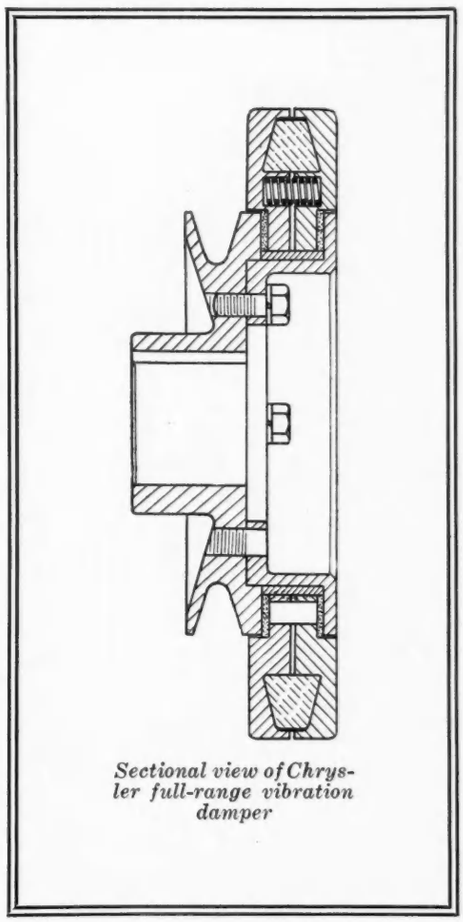
Torsional vibration may be controlled in two ways. In the first place, the torsional vibration characteristics of the crankshaft assem-

Crankshaft Assemblies

By
P. M. HELDT

bly may be modified in such a way as to make them less harmful, and, secondly, the damping forces may be increased so that the vibration can never attain such magnitude as to become objectionable.

Apparently the simplest method of eliminating serious torsional vibration is to make the rate of natural vibration of the crankshaft so high that the rate of vibration producing impulses can never equal it. The maximum rate of vibration-producing impulses, of course, is determined by the maximum speed at which the engine is to run and by the number of pistons connected to the crank. Keeping down the engine speed and the number of cylinders would also make it possible to prevent torsional vibration, but multi-cylinder engines and high engine speeds are called for by market conditions, and these may therefore be ruled out as possible solutions of the problem. Therefore, we cannot lower the rate of vibration-producing impulses, but we may increase the natural rate of vibration of the crankshaft assembly. This can be done by making the shaft larger in diameter, shortening it as much as possible, and reducing the weights of masses attached to it, such as pistons and connecting rods. This is generally the first remedy applied when torsional vibration is experienced.



Sectional view of Chrysler full-range vibration damper

In order to produce synchronous vibration it is not necessary that impulses should be received by the crankshaft at a rate equal to its natural rate of vibration. We may imagine the crankshaft to execute two complete cycles of vibration under one impulse, and then to receive another impulse just as it is beginning to "wind up" for the third time. Under this condition there will also be a gradual increase in the amplitude of vibration; similarly, if the crankshaft receives an impulse at every third or fourth cycle. However, the greater the number of cycles between successive impulses, the more nearly the original vibration will have been damped out by the time the next impulse is received and the smaller will be the maximum amplitude reached by the vibrations. Hence, a crankshaft has not only one critical speed but a series of critical speeds which bear to each other the relation 1:2:3:4:5, etc. The highest or basic critical speed is that for which one impulse is received during each cycle of natural vibration of the shaft, considering such an impulse to be produced by each explosion. The next critical speed is that at which one impulse is received for every two cycles of natural vibration, the next for every three cycles, etc.

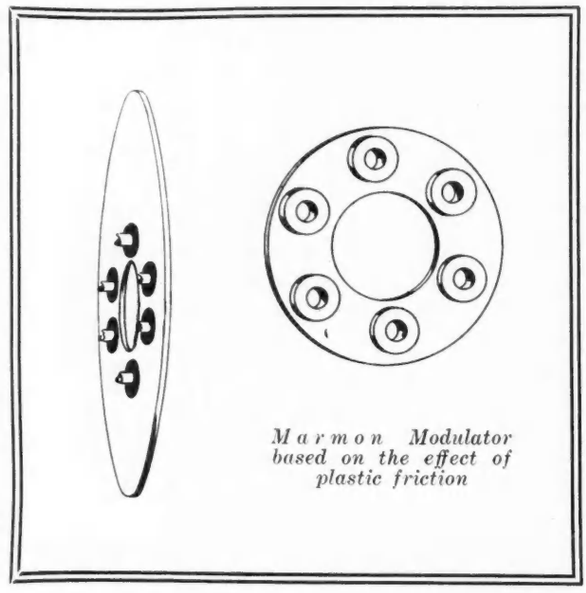
A more scientific method of dealing with the subject consists in considering each explosion as productive of a number of impulses. As a matter of fact, the successive explosions produce on the crankshaft a torque or turning moment which may be represented by a curve of definite period but irregular form, and according to Fourier's theorem such a curve can be resolved into a series of harmonic curves or sine curves of periods equal to 1/1, ½, 1/3, ¼, etc., of the period of the irregular periodic curve. Thus there are twisting moments active on the crankshaft which are harmonics of different orders, and if the twisting moment of any order is in synchronism with the natural vibration of the crankshaft there will be more or less serious torsional vibration.

In a six-cylinder engine there are three explosions per crankshaft revolution, and at 3000 r.p.m. there are therefore 9000 explosions per minute or 150 explosions per second; hence, the natural rate of vibration of the crank assembly would have to be less than 150 per second to produce first-harmonic synchronous vibration assuming 3000 r.p.m. to be the speed limit of the engine; 300 per second to produce second-harmonic synchronous vibration, and 450 per second to produce third-harmonic synchronous vibration.

The distribution of the masses along the crankshaft has an effect on the vibration produced. Under an impulse from one of the forward cylinders the forward end of the crank naturally snaps ahead or twists forwardly. The amount of twist in the crankshaft decreases from the point at which the impulse is received, toward the rear, and there is a nodal point, at which there is no vibration, a short distance ahead of the flywheel, generally at some point along the rear main bearing. The flywheel itself does not turn at absolutely uniform speed but has a periodic motion of the same frequency as that of the crankshaft, superposed upon its uniform rotary motion. The periodic motion of the flywheel or rear end of the crankshaft is displaced 180 deg. or half a cycle with respect to that of the forward end of the crankshaft; that is, as the forward end of the crankshaft speeds up, the rear end slows down, and vice versa.

By changing the distribution of the masses along the crankshaft its torsional vibration can be modified. For instance, if an additional flywheel is placed on the crankshaft at the forward end, equal in every respect to

the flywheel at the rear, then the nodal point will be at the middle of the crankshaft, and both ends of the shaft will vibrate more or less equally. Therefore, the addition of a forward flywheel, while it will reduce the vibration of the forward end of the crankshaft, will also increase the vibration of the rear end. In addition to equalizing the vibration of both ends, the addition of the forward flywheel affects the vibration characteristics in other ways, for the vibrating mass is greatly increased. Any other change in the masses of the crankshaft assembly, such as the addition of crankshaft balance weights, affects the vibration characteristics. The addition of weight that does not increase the stiffness of the shaft always lowers its natural rate of vibration and therefore tends to bring the lower harmonics or higher critical speeds within the engine speed range.



Marmon Modulator based on the effect of plastic friction

When torsional vibration first became a factor to be reckoned with, modification of the vibration characteristics by changes in crankshaft design served for a while to ward off trouble, but with increasing engine speeds and the adoption of eight-in-line engines the use of dampers became almost a necessity.

To produce a damping effect on a vibrating body it is necessary to absorb the energy stored up in the vibrating body (which constantly changes from the static form, at the end of each swing, to the kinetic form at the middle of the swing, when the vibrating body is moving at its highest speed).

Energy can be absorbed through friction. In thinking of friction we usually think of one solid body moving over another in contact therewith, which produces so-called solid friction. It was this form of friction that was used in the earliest type of torsional vibration damper, that devised by F. W. Lanchester, which has been widely used in this country and abroad. The device, of course, must be so arranged that there is motion at the frictional surfaces only when there is torsional vibration, but no motion when the crankshaft turns uniformly. This is accomplished in the Lanchester vibration damper (illustrated in Fig. 1) by mounting a flywheel on the crankshaft so it is held frictionally thereon. Owing to the inertia of the flywheel, it offers great resistance to rapid changes in angular speed, and if the forward end of the crankshaft changes its speed very rapidly, the flywheel cannot follow and slips on the members supporting it. The energy thus absorbed by friction is abstracted from the crankshaft, and vibration is damped out.

The friction between the damper flywheel and its supports must be so adjusted that it is less than the force necessary (referred to the mean radius of the friction surface) to accelerate the damper at the rate at which the forward end of the crankshaft accelerates under the impact of explosions; yet it must not be very much less, as in that case it would not absorb the energy stored in the crankshaft sufficiently rapidly. Hence the frictional surfaces of the vibration damper are forced together under spring pressure, and means are provided for adjusting this pressure.

It was pointed out in the foregoing that an engine has not only one but a number of critical speeds. If the damper is adjusted so it acts properly at the highest critical speed within the operating range of the engine, it will be too tight for the other critical speeds; hence, there will be no slippage and no absorption of energy; that is, no damping. Now ordinarily the main trouble is with one particular critical speed, which corresponds to the second harmonic of the impulse-producing torque. Modern crankshafts generally are so proportioned that the rate of complete cycles of torsional vibration of the crankshaft coincides with the rate of explosions only at speeds which are above the operating range of the engine. Thus the second harmonic, which corresponds to one explosion in the engine to every two complete cycles of torsional vibration of the crankshaft, is the one that gives the most trouble and has to be provided against chiefly in the design of the damper. Of course, many of the higher harmonics fall within the working range of the engine, but the amplitudes of these higher harmonics are much smaller than those of the first and second, and their potentialities for inducing crankshaft vibration are therefore less. However, if a damping device can be provided that will take care of all the critical speeds, it is certainly an improvement. This requires that the friction at the frictional surfaces of the damper vary with the speed.

This problem was investigated by the Chrysler engineering staff. It was found that the factors which affect the frictional or damping action are the polar moment of inertia of the damper flywheel, the friction coefficient of the surfaces in contact, and the pressure with which they are pressed together. A torsional vibration damper was therefore built in which one of these factors, the spring pressure, could be varied at will, and in experimenting on a Chrysler 80 engine it was found that whereas a spring pressure of 120 lb. sufficed to damp out vibration at the lowest perceptible critical speed, a pressure of 1400 lb. was needed at the highest speed. By thus varying the spring pressure it was found possible to eliminate torsional vibration at all speeds to such a degree that the periods were barely visible when the crankshaft was tested on the torsional vibration indicator designed by C. E. Summers and R. K. Lee and which was described in *Automotive Industries* of June 10, 1926. The force required to press the frictional surfaces together to eliminate vibration at the different speeds was then plotted against the speed, and the curve obtained was of the general form of a parabola, the force being proportional to the square of the speed. Since centrifugal force varies as the square of the speed, it was decided to employ means subjected to centrifugal force to press the surfaces together.

A sectional view of the Chrysler full-range vibration

damper is shown in Fig. 2. The cross-sectioned area of trapezoidal form represents a "leaded" rubber ring encased within grooves turned in the damper wheels. On the outside this rubber ring is surrounded by a brass ring to prevent flow of the rubber into the space between the two wheels. A bronze ring is fitted over the support for the damper rings and acts as a bearing for the latter. We understand that the idea of employing the centrifugal force on an extensible ring to force the two damper rings apart in proportion to the square of the speed was due to Carl Breer, and a patent application on the damper has been filed in his name.

In developing this full-range damper, centrifugal masses of different materials, such as bronze, steel and plain lead, were experimented with, and in some cases levers were employed to multiply the centrifugal force in transmitting it to the frictional surfaces. As the result of the experience thus gained the device now in production was designed. It was seen to be desirable to develop a material with a comparatively high specific gravity (so the centrifugal force on it would be high) and which at the same time would conform closely to the ring groove and preferably have a distinct flow under centrifugal force at the higher speeds. These requirements were finally met by the use of a heavily loaded rubber compound with a specific gravity of 4.7 and over. This high specific gravity is obtained by mixing a comparatively large proportion of litharge in the rubber to form a homogeneous mixture.

The springs provided to press the friction surfaces together have sufficient force only to take care of the fourth, fifth and sixth harmonics of the crankshaft torque but the rubber ring adds sufficiently to the pressure on the surfaces to take care of the first, second and third harmonics. With this particular crank assembly, assuming that there is one explosion per vibration cycle, the highest critical speed is 4100 r.p.m.; the second, 2050 r.p.m.; the third, 1366 r.p.m.; the fourth, 1025 r.p.m.; the fifth, 820 r.p.m., and the sixth, 638 r.p.m. Without the damper all of these periods are plainly visible on the torsional-vibration indicator, while with the device all are completely eliminated, so far as noise is concerned, with the exception of the first, which is above the operating range of the engine and therefore does not need to be considered. Without the damper the approach to the first critical speed of 4100 r.p.m. becomes noticeable even at 2900 r.p.m., the torsional-vibration indicator showing a diagram departing from a circle and tending to become triangular. Speeding up the engine further (without the damper), at 3900 r.p.m. (or 200 r.p.m. below the true critical speed) vibration becomes so serious as to threaten to break the crankshaft. With the damper the first signs of an approach to the first critical speed appear only at about 3700 r.p.m., and even then the amplitude of the vibration is insufficient to make it audible.

There are other forms of friction besides that between surfaces of solids, namely, plastic friction, within the mass of material such as rubber, which is capable of elastic-plastic deformation, and fluid friction. All of these forms of friction are now being made use of for damping the vibration of chassis springs, and torsional vibration dampers making use of plastic friction and fluid friction also have been developed or are under development. Usually, when we think of rubber we think of an elastic body which when deformed will freely return to its original shape after the force which caused the deformation is removed. However, rubber is not perfectly elastic. If subjected to a tension which is increased by steps up to a maximum and then decreased to zero by equal steps, it is found that for the same tension on the rubber its length will be different according to whether the tension is increasing or decreasing. With perfect elasticity the length of the rubber would be the same for a given tension on it whether the tension just previously had been higher or lower. Any inequality of length under the same tension during the "increase" and "decrease" portions of the cycle shows that there are internal losses, which usually make themselves apparent by an increase in the temperature if the material is subjected to a rapid succession of stress cycles. These losses are greater in rubberized fabric as used in pneumatic tires, as the fabric is less elastic than rubber.

A torsional vibration damper based on the effect of plastic friction has been developed by Thomas J. Litle, chief engineer of the Marmon Automobile Co. This damper (Fig. 3) comprises a metal disk on the forward end of the crankshaft which is driven through rubber clutch members. When the forward end of the crankshaft rotates at uniform speed the disk evidently rotates with it as though it were rigidly mounted on it, but if the shaft vibrates torsionally the angular motion of the disk also will be irregular, and the rubber evidently will be subjected to cycles of torsional stress.

(*Continued on page 701*)

The harmonic balancer, used on a number of General Motors cars

Just Among Ourselves

Americanization of Europe's Industry

CABLE from Paris to the *New York World* quotes Municipal Councillor Dausset as expressing fear of Americanization of Europe's industry and as stressing the American economic invasion of Europe, as seen in the advantages America reaped from the Dawes plan, which by restoring German currency and German credit enabled American industrialists to exploit a first-class market on the other side of the Rhine for their dollars and goods.

M. Dausset is quoted as painting a dark picture of American automobiles successfully competing with the best French cars despite the high customs tariff and also as admitting that American cars "are often of superior workmanship" and that it is becoming fashionable in France to drive them.

* * *

Profit Comes After Wealth Creation

FROM the standpoint of national pride or of political thinking, this feeling is quite natural; from a material or an economic standpoint it would seem to have little sound foundation. It's the old story of the psychological difficulties inherent in the creation and distribution of wealth. It is the sort of thinking which will admit, for example, that Henry Ford first made it possible for millions of Americans to have quick, cheap, individual transportation—gave them a great big dollar's worth—and then will begrudge Mr. Ford the huge profits which he got from his venture.

It is, in some ways, the same kind of thinking as that involved in the book by R. W. Dunn, to which we devoted a lot of space last week in this department. Mr. Dunn points to the huge profit totals of the automotive companies and assumes that this total revenue from an industry is more or less a static thing; that, if material parts of it were to be taken away through far larger wage distributions, the total for distribution still would remain. As a matter of fact it is the possibility of large profit that makes it possible to get the money to risk in large industrial ventures. These ventures today usually bring better goods and lower prices to the users of the product. They also bring profits to the entrepeneur. Without the profits, the industry—and hence the better goods and cheaper prices for the users—never would exist, or would cease to exist.

* * *

Creation of Wealth—Not Exploitation

THE same principle holds in many respects, as we see it, in regard to American penetration of European industries. American companies investing in foreign production expect to make money from those investments. They expect to make that money, however, through the creation of new economic goods in those countries and in no sense through the depletion of any resources now existent. The countries themselves and their citizens will derive definite material gain from any American control which may exist; unless they do, no American gain can or will accrue. Such is the law of modern industrial development.

* * *

No Money-Pinch in Industry Now

ASKED one of the country's leading banker-economists the other day whether, in his estimation, demands for money for use in stock market speculation had yet made it generally difficult for industry to obtain capital for its needs in any large number of instances. His answer was "No"; but he qualified it as follows: "There are undoubtedly a number of projects which are now being held up because of high money rates; marginal projects which would be economically profitable if money rates were lower. Eventually, the pinch would seem certain to be felt by industry generally."

* * *

Car Dealer Looks Sound to Banker

ASKED this same man what he thought of the automobile dealer as a business man these days as compared to retailers in other lines of commerce. "The automobile dealer," he said, "is way up at the top. He is handling his business better today than ever before and on the average looks good from a banker's point of view when compared with the average of retailers in other lines."

* * *

Ewald 33° Member of Hole-in-One Club

HENRY T. EWALD of Detroit, for five years a member in good standing of the Hole-in-One Club, refurbished his honors recently by repeating the feat at the Biltmore Forest Country Club, Asheville, N. C. Mr. Ewald, president of the Campbell-Ewald company and member of the Bloomfield and Oakland Hills Country Clubs, popped his drive into the cup on the 162-yard Ninth Hole at the southern course, according to witnesses, among whom were his daughter, Shirley Ewald, Mr. and Mrs. Thomas Carey of Detroit, and Mr. Ewald's caddie, Roosevelt Dobbs. Mr. Ewald's hole-in-one is the first bulls eye registered at the Biltmore course this season. His previous achievement of a like nature was scored March 30, 1924, on the 150-yard Seventeenth Hole of the course at Biloxi, Miss.—N.G.S.

Minor *Price Changes* in Durant Line; *Mechanical Revisions* Made

Output for first quarter exceeded that for same period of 1928 despite the recent transfer of manufacturing operations.

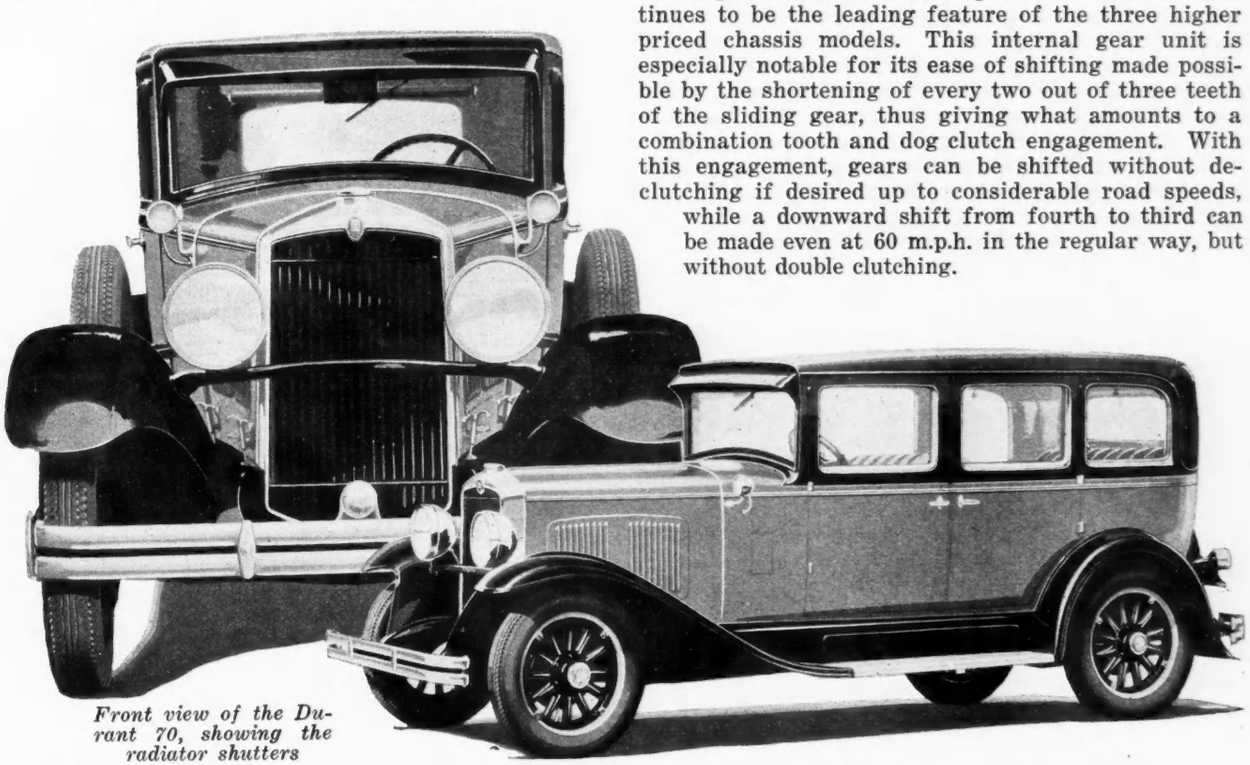
IN spite of the fact that Durant Motors, Inc., transferred its manufacturing operations from Elizabeth, N. J., to an enlarged plant in Lansing, Mich., within the last few months, its production for the first quarter showed a gain over the first quarter of 1928 from 20,976 to 21,075. Shipment of the 66 and 70 models are beginning this week, and this will add further to the production schedule. While the majority of Durant cars turned out in 1928 were four-cylinder models, during the first quarter of the current year the domestic demand has been mainly for sixes, while among the cars exported the fours continue to lead.

Of the passenger cars which constitute the present Durant line, the 6-66 at $895 to $975 and the 4-40 at $595 to $696 are already well known. The 6-60, ranging from $685 to $750, and the 6-70, at $1,195 to $1,285, were described in these columns at the time of the New York Show, although not then in production.

Since show time, however, a number of changes have gone into effect, including some minor price revisions. Thus the 6-60 sport roadster is now priced at $685 instead of $650; and the cabriolet and sedan models on this chassis now list at $750 instead of at $745. De luxe models on the 6-66 line are now $130 higher than the standard models, instead of $115 higher, as formerly. The cost for de luxe equipment on the 6-70 models is now $140, also an increase over the former price of $125.

In the bodies, a number of minor changes have been made to improve the appearance, including the dropping of the grid in front of the radiator core, and the adoption of thermostatically controlled shutters on the 6-70. Mechanically the most important change is in the 6-70 powerplant, which has a 5/8 in. longer stroke than when first announced, its bore and stroke now being 3 3/8 by 4 5/8 in. This increase in piston displacement of 33 cu. in. to 248 cu. in. resulted in an increase of 5 hp. in maximum output, the engine now developing 70 hp. at 3000 r.p.m. A slight increase in the size of the valves—both of which now have head diameters of 1 5/8 in.—also contributed to the increase in engine power.

In the chassis there has been a slight lengthening of both front and rear springs on the 66 and 70, front springs on both now being 36 in., and rear springs 54 in. long. The Durant four-speed transmission continues to be the leading feature of the three higher priced chassis models. This internal gear unit is especially notable for its ease of shifting made possible by the shortening of every two out of three teeth of the sliding gear, thus giving what amounts to a combination tooth and dog clutch engagement. With this engagement, gears can be shifted without declutching if desired up to considerable road speeds, while a downward shift from fourth to third can be made even at 60 m.p.h. in the regular way, but without double clutching.



Front view of the Durant 70, showing the radiator shutters

Side view of the 6-66 four-door sedan also now in production. Note that the grid in front of the radiator has been dropped

Yellow Coach Z-240 Chassis, Goes Into Regular Production

Developed from Model Z-6, the Z-240 includes features which make it adaptable to either parlor car bus body, standard or large city type bus bodies.

REGULAR production has been started on the Yellow Coach Z-240 chassis, of which the first examples were shown at the American Electric Railway Association exhibition last fall. The chassis is a development of the Model Z-6, formerly produced by the company, but improvements in design have been made in practically every part. In redesigning the chassis, the engineers paid particular attention to the problems that arise through the necessity of fitting bus chassis with different types of bodies. The Z-240 chassis is adapted to take either a 29-passenger parlor car, a regular 34-passenger city, or a 39-passenger city bus body, but to obtain enough room for seats for 39 passengers, the control devices have to be arranged differently. The steering column and all controls have to be moved forward 11 in., and the connections from the different control members changed accordingly. When the steering gear is mounted in the usual position, for the two types of bodies first mentioned, it is made adjustable as to rake to two positions, to suit the different locations of the driver's seats in these bodies.

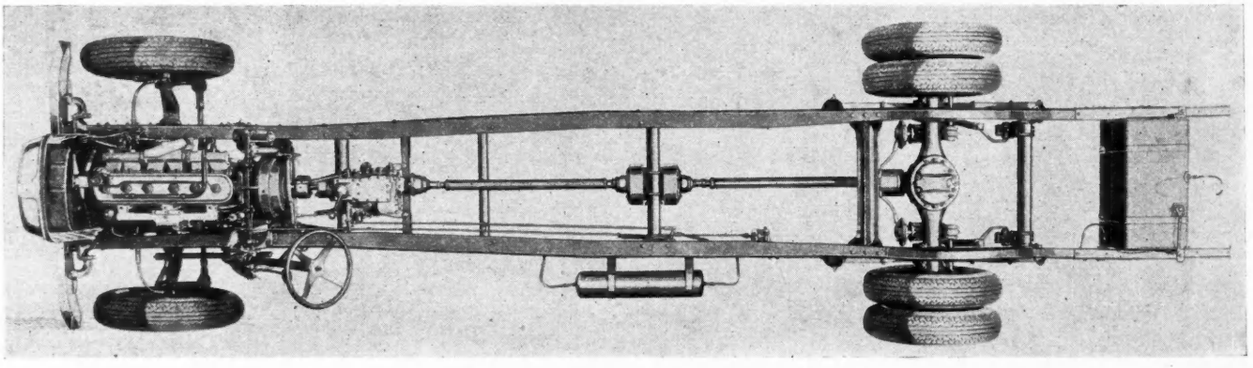
The wheelbase of the new chassis is 240 in., hence the model designation "Z-240." With the longest body, that for 39 passengers, the overall length is within 30 ft., which meets legislative requirements in all except a few of the states. At the rear axle the chassis has an overall width of 96 in.; the front-wheel tread is 75 in., and the turning radius for turns to the right is 36 ft. The chassis weighs approximately 9400 lb.

In redesigning the chassis, the engineers aimed at simplicity and accessibility of all parts, so as to facilitate repairs when they become necessary. Proper protection of all working parts from dust and dirt also received careful attention. To provide room for 39 passengers, it was necessary to move the dash forward, causing the engine to project into the body; but engine accessibility was maintained even in this case by providing housing and floor plates of aluminum which can be removed quickly, and then give access for any necessary adjustments or repairs.

The sleeve valve engine is of the same cylinder dimensions as that on the Z-6, the bore and stroke being 4¼ by 5½ in., which gives a piston displacement of 468 cu. in. It develops 101 hp. at 2000 r.p.m. This is an increase in output as compared with the previous engine, which is due to the use of a greater compression ratio, made possibly by the use of new cylinder heads of aluminum alloy, for which it is also claimed that they insure a better seal at the junk rings and longer life of the spark plugs. Improvements in the carburetor and manifolding also have contributed to the increase in power.

Numerous changes were made in the engine oiling system, which tend to improve lubrication and to keep down the oil consumption. A larger sump with increased radiating surface keeps down the temperature of the oil. The oil pump capacity has been increased, and a number of improvements have been made in the Skinner rectifier used with these engines, which improve its operation and render it more accessible for cleaning. An oil filter is mounted integral with the rectifier, thus eliminating the need for extra piping. The oil pressure regulator is still interconnected with the throttle valve, to give an increased oil supply to the working parts with increase in engine load. The drive chain of the air compressor is lubricated automatically.

Three-point support is now used for the engine, there being a trunnion support at the front and spring-loaded

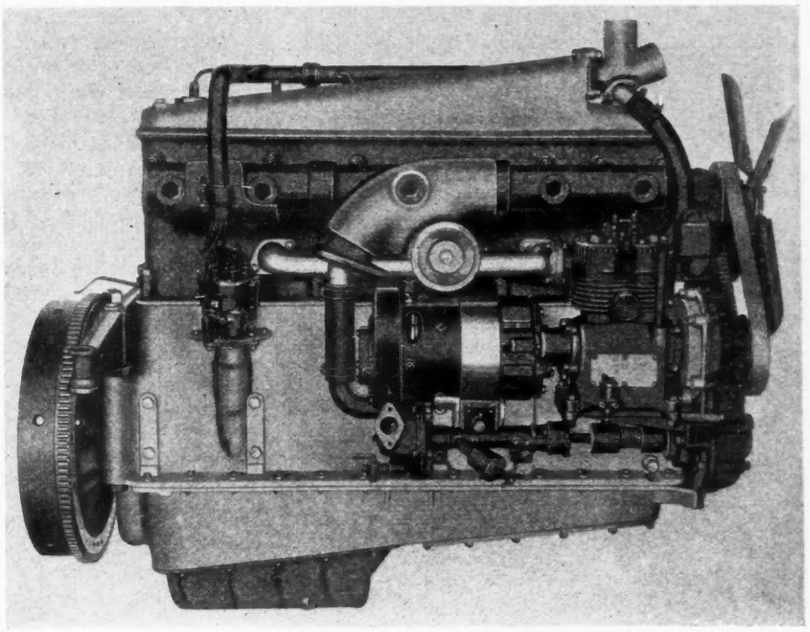


Plan view of Yellow Coach Type Z-240 chassis

With Greatly Improved Design,

ball and socket supports at the ends of the drop-forged steel cross-arm at the rear. Steel-backed main bearings are used, which assure constant clearances at the bearings throughout the temperature range, and an automatic take-up is provided for the front-end drive chain.

A large increase has been made in the cooling capacity, the frontal area of the radiator being 25 per cent greater and the water capacity 50 per cent. Except in hot weather and under otherwise unusually difficult conditions, sufficient cooling effect is produced without the fan in operation. The radiator shell, of polished aluminum, has been redesigned to make it narrower and higher, in accordance with the modern trend, and a large diameter low cap of the "snap-on" type is provided. Provision is made for the installation of a thermostat in the top tank, for the operation of an automatic winter-front. The installation can be made without draining the water from the cooling system.

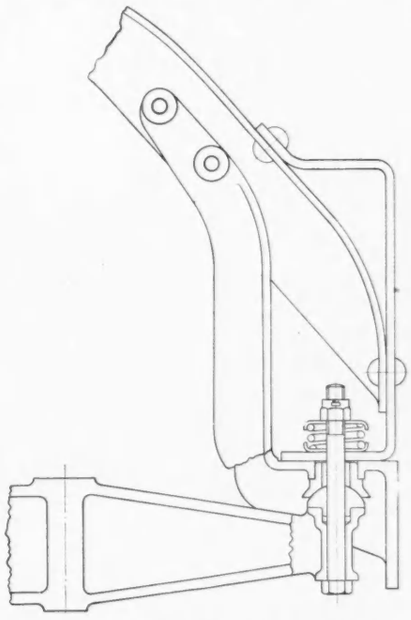


Right side view of engine

A number of changes have been made in the radiator mounting, to reduce the strains on the core and shell to a minimum, and to minimize the movement of the radiator relative to the body. The radiator is supported on a wide spring-steel plate which is fastened at its middle to a bracket on the forward frame cross-member. The ends of the plate are secured to the bottom shell of the radiator, at bosses thereon, by means of spring-loaded cap screws. The core fastens to the shell at these same points, and thus the weight of the core is directly transferred to the supporting member, thus relieving the shell of all unnecessary stresses. Tie rods extending from a central bracket on the top of the radiator to each side of the dash prevent side-sway of the radiator relative to the body.

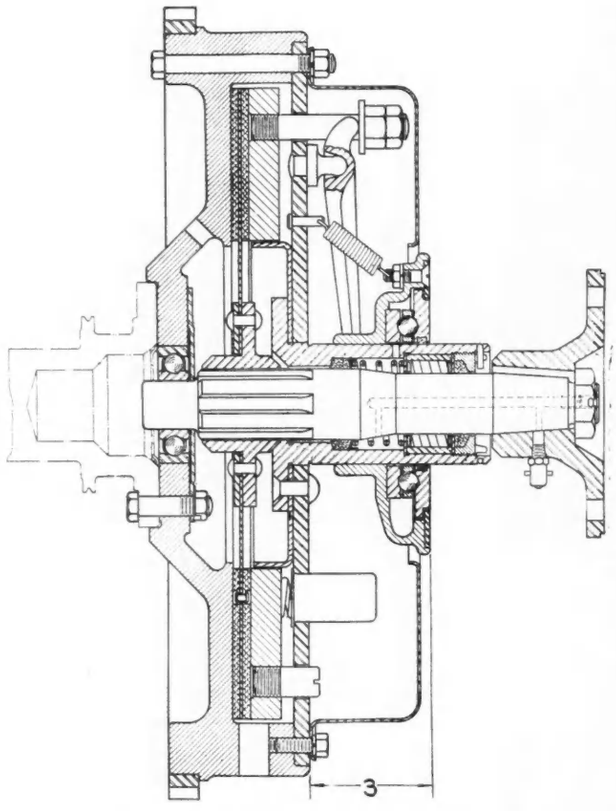
A fuel tank with a capacity of 68½ gal. is supported through a thick felt pad on a sheet metal tray carried on extensions of the frame side rails, and is held down by two wide steel straps. Large-diameter, flexible tubing is used for the filler spout, to relieve the tank of stresses due to body weave. The amount of fuel in the tank is indicated by a dial on the dashboard forming part of an electric tank gage. Fuel feed is by an A.C. fuel pump driven by an eccentric on the rear end of the ecentric shaft.

The single-plate clutch has been enlarged in diameter to give 18.5 per cent more frictional area, and the number of clutch springs has been increased to insure more nearly uniform distribution of the pressure. The clutch shaft is now supported in a substantial Hyatt bearing at the rear, in addition to the ball-type pilot bearing in the flywheel web. The clutch is actuated by means of three multiplying levers which are located outside a heavy plate secured to the rear of the flywheel, and provided with a thin sheet metal cover that excludes dust and dirt. This cover over the levers also serves to induce air circulation through the clutch, the air entering through an annular opening between the housing and the clutch shaft, and escaping through holes in the flywheel rim in line with the clutch facings. These holes permit of a ready inspection of the lining for wear, and they allow any particles worn off the lining to escape.



Flexible engine mounting on frame

The clutch-throwout mechanism is quite unusual. Instead of the ordinary yoke, with its fulcrum as near the axis of the clutch shaft as possible, a long, pressed steel yoke in the form of a single-armed lever is employed, extending transversely across the frame and fulcrumed at its right end by means of a pivot stud with hand adjustment. The left end of this yoke is operated by a lever mounted on the inner end of a shaft extending through a bracket on the lower flange of the frame side rail. On chassis using mechanical



Section through single-plate clutch

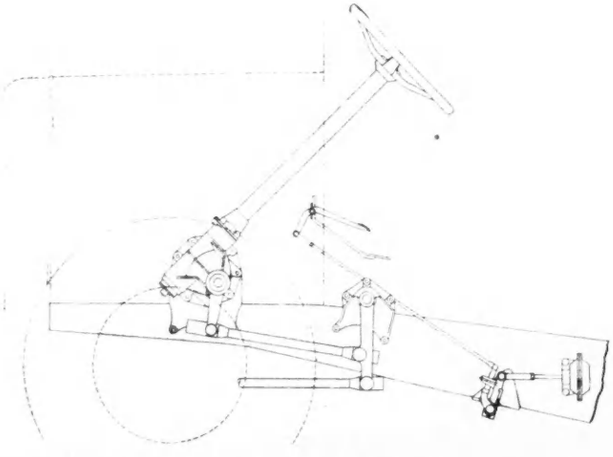
control, the clutch pedal is mounted on the outer end of this shaft. In chassis with air control, the pedal is replaced by a release lever coupled to the pushrod of a Westinghouse brake chamber mounted on the frame side rail. This release lever also carries a valve which is connected to the air storage tank and to the operating chamber, and has an exhaust port to atmosphere. This valve is controlled by another lever, pivotally mounted on the same shaft as the release lever, and connected by rods to a pedal. The clutch is disengaged in the usual manner by pressing on the pedal. Movement of the clutch throw-out collar in both directions is directly proportional to the pedal movement. If the pedal is depressed slightly and held stationary, the resulting movement of the valve uncovers a port and admits air under pressure to the operating chamber, which forces the lever forward. With the control lever held stationary by the pedal, forward motion of the release lever moves the valve in the opposite direction, thus closing the port and cutting off the air pressure. With the air cut off, the release lever stops moving until the pedal is moved farther. If the pedal is now allowed to return slightly, the resulting movement of the valve opens the operating chamber to the atmosphere and the drop of pressure in the chamber allows the lever to move back until the valve closes again. If pressure is removed from the pedal, the valve is held in the exhaust position by the return spring, and the clutch is fully engaged.

This pneumatic clutch control mechanism is so designed that in an emergency the clutch can be released directly (or mechanically) by exerting a greater pressure on the pedal.

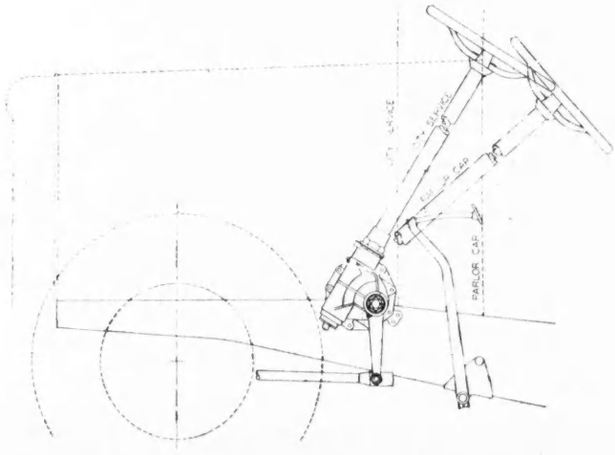
Gear shifting is facilitated by the provision of a clutch brake. The large diameter of the clutch brake surface makes it quite effective, and excessive pressure is guarded against by spring-loaded application.

The transmission is a four-speed constant mesh design and is mounted amidships a short distance back of the engine. A short coupling of the rubber-ball cushion type is interposed between the coupling flange on the clutch shaft and a flange on the transmission shaft. The gears of the transmission are of 5 per cent nickel steel, case-hardened, and all except the low-speed and reverse gears are ground on the teeth. All shafts are of heat-treated alloy steel and are supported in ball bearings, with the exception of the pilot of the splined shaft, which is a Hyatt bearing. The cast iron crankcase is split through the axes of the main and secondary shafts and is provided with large flanges. Three-point support is used for the transmission. At the forward end, there is a ball and socket support, the ball being piloted in a boss on the bottom of the case, and the socket carried on a bracket on a frame cross-member. A spring-loaded cap screw passing through a clearance hole in the socket and screwing into the case holds the latter in place and provides a certain amount of flexibility. At the rear, the case is supported by widely-spaced integral arms which are bolted to a frame cross-member.

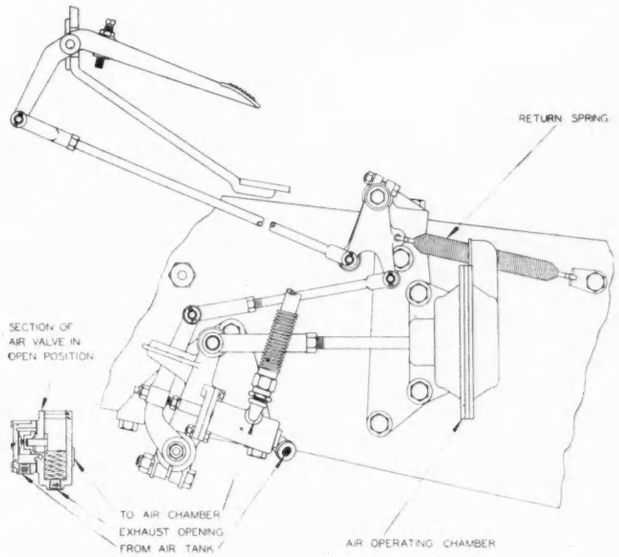
The shifter rods are located in the upper part of the housing and extend forward into a pocket formed integral with the housing, in which the shift lever engages one or the other of the rods. On chassis having the



Mounting of controls for 39-passenger city service bus



Mounting of controls for parlor car and 32-passenger city service bus



Above—Air control of clutch

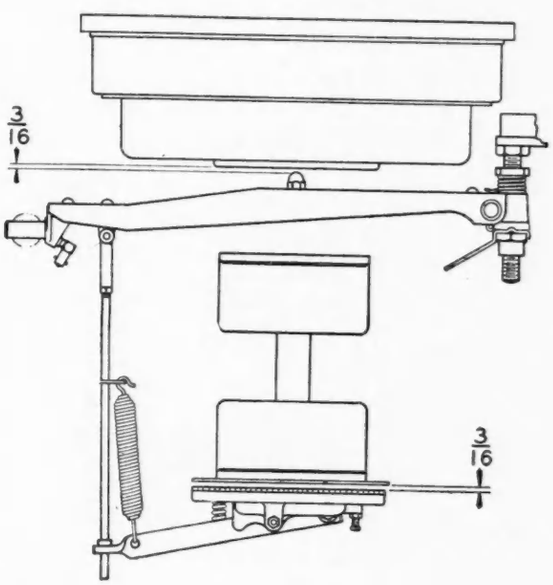
conventional control location, a cane-type of shift lever is supported in a socket on a tower directly over the shifter rod end pocket. The shift lever positions are conventional, the reverse position being to the right and back. In order to engage the reverse, the lever must first be depressed before it can be shifted into engagement.

In chassis for 39-passenger bodies, although the shifter lever has been moved ahead and to the left, no extra external rods and levers are required. A lever extending horizontally to the left has a downward projection on the inner end, which engages into slots in the forward end of the shifter rods. This lever is housed in a pocket in the upper half of the transmission case, and its outer end is pivotally connected to a lever extending forward horizontally. This lever is housed in a casting bolted to a machined face, and extends forward to the desired shifter position. Both of these levers have machined spherical surfaces about midway of their length, these surfaces resting in guide blocks in the transmission case and the casting. The front end of the lever is actuated by a shifter lever, which is mounted in a ball-and-socket joint at the front end of the casting housing this lever. This mechanism serves to transmit the motion of the shifter lever to the shifter rods. In this case, too, all parts are fully enclosed and work in oil.

From the transmission, the power is carried to the rear axle through two large - diameter tubular propeller shafts with metal universal joints. Between these two shafts there is a self-contained center-bearing assembly mounted on a tubular cross-member of the frame. Both of the propeller shafts are identical in design and therefore interchangeable, and, as compared with the length of the chassis, they are quite short and rigid.

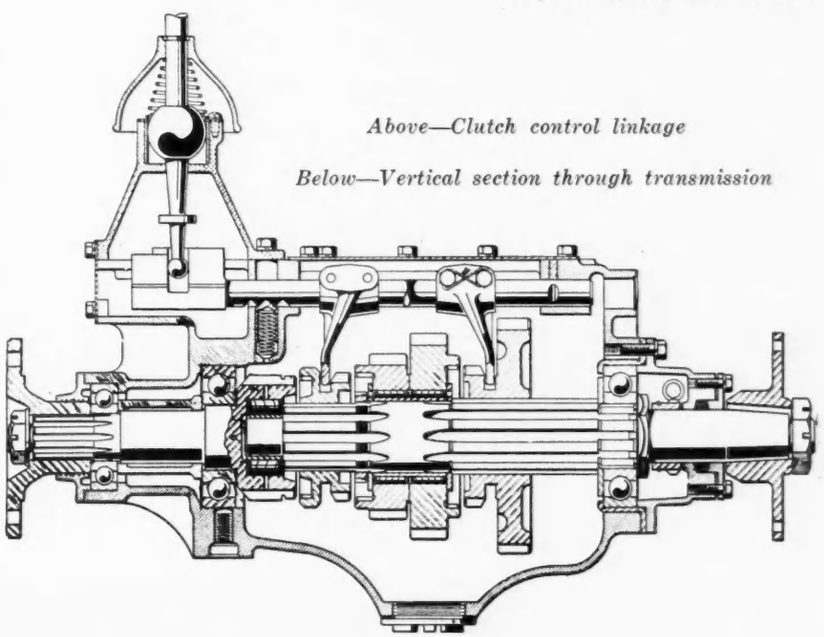
The center bearing assembly consists of a rigid housing in which is carried a stub shaft between two well-spaced anti-friction bearings. The rear bearing—a double-row radial-thrust ball bearing—takes the thrust from the rear propeller shaft, while the front bearing is a Hyatt bearing. Both ends of the bearing are closed by bolted-on caps carrying spring-loaded leather oil seals, which bear on the shaft. This bearing has a large oil pocket, and the drain plug in the bottom of same has a hollow stem projecting upward into the pocket to the level at which the oil is to be maintained. If an excess of oil is poured into the pocket through the filler, it immediately drains off through this hollow stem. Thus the oil level is maintained at the correct height, which is below the lower edge of the shaft seals, and the hollow stem also acts as a breather, preventing the accumulation of pressure in the housing. Prevention of oil leakage at this point is of particular importance, since oil escaping here would find its way onto the emergency brake drums, which are mounted on opposite ends of a short intermediate propeller shaft, and not only would reduce the effectiveness of the brakes, but might become ignited from the heat of the braking. The complete center bearing and brake drum assembly is put in running balance, as are also the propeller shafts.

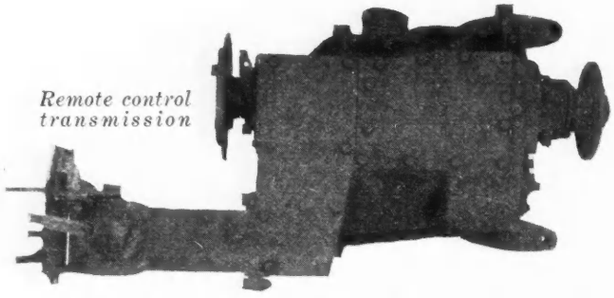
The rear axle is of the semi-floating type, with underslung worm drive. Its housing is a one-piece drop-forged heat-treated member



Above—Clutch control linkage

Below—Vertical section through transmission





Remote control transmission

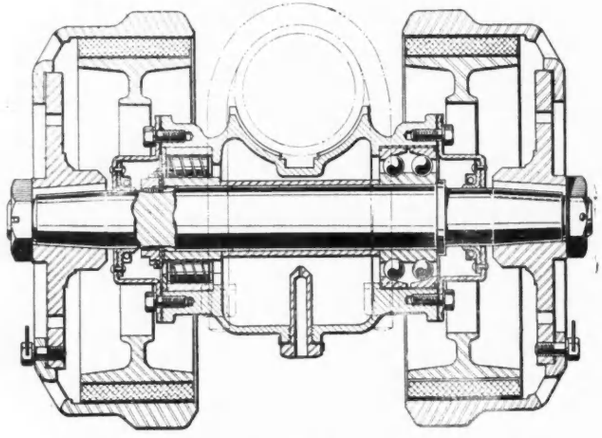
with end flanges and spring pads forged integral. The worm shaft is carried on double-opposed taper roller bearings at the rear end, and on a Hyatt bearing at the front end. The worm wheel and differential assembly is carried on two opposed taper roller bearings provided with screw adjustment. Drive shafts are 4 in. in diameter at the bearings, which are of the double-opposed taper roller type. Wheel hubs are keyed on long tapers on the shafts and are held in place by large nuts locked by special washers held by the hub cap screws. Three spring-loaded leather oil seals are provided on each shaft, one near the inner end and one on each side of the wheel bearing. In addition, oil slingers are provided to prevent leaking oil from getting onto the brake drums.

The front axle—of the reverse Elliott type—has an alloy steel center member. The I-section between spring pads has been increased in size for additional strength, while between the spring pad and the knuckle the section changes from an I to a solid round, this enabling it to take care better of torsion from the front wheel brakes. The knuckle pins are outwardly inclined, to give approximate center steering. The weight of the vehicle is carried on especially designed ball bearings located between the end of the axle center and the lower arm of the knuckle yoke. The knuckle pin is drawn tightly into a taper seat in the end of the axle center by a nut bearing against a hardened steel sleeve, which also acts as a bearing for the upper end of the knuckle yoke. Wheel hubs are mounted on opposed taper roller bearings, widely spaced. The end of the hub telescopes into a counter-bore in the backing plate, and a large-section cork seal located in this counter-bore prevents leakage. An oil slinger is also provided.

The service brakes operate on all four wheels, and are of the Westinghouse air-operated diaphragm type. There are two expanding shoes in each drum, and each shoe is fitted with two blocks of molded lining, held in place by brass keepers, screws and nuts. The cams used are of the constant-leverage type and exert the same force on each shoe irrespective of the angle to which they are turned. Each brake can be adjusted individually, by means of a worm-and-wheel mechanism. All four drums are 17¼ in. in diameter and are of gun iron, of heavy section. The width of the linings is 4 in. in the front brakes, and 5½ in. in the rear brakes.

Air pressure is supplied by a two-cylinder vertical compressor mounted on the engine, which delivers to a storage tank carried on the left frame side rail. The compressor cuts in automatically when the pressure in the tank drops to 75 lb. per sq. in., and cuts out again when it reaches 85 lb. Application of the brakes is effected through a foot-operated control valve, and a quick-release valve is inserted in the line to the front brakes, to assure immediate release of these brakes.

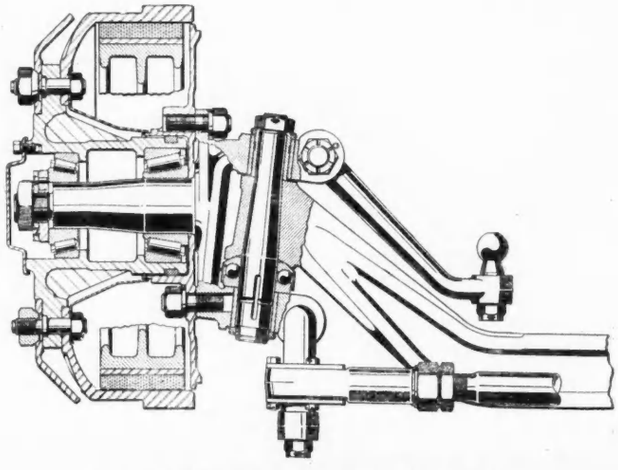
The emergency brake is a double brake, acting on two drums mounted on flanges at the ends of the short intermediate propeller shaft. There are two shoes in each drum, each shoe being provided with a single block molded lining 3½ in. wide and held in place by brass keepers and cap screws. The drums are 11 in. in diameter and are of heavy section gun iron. Cams used to expand these shoes are also of the constant leverage type, each cam being provided with an adjustable lever arrangement to permit the entire thickness of block to be worn off. Levers are lugged, however, to limit their rotation, and so to prevent the drums from being scored by the keeper screws. An equalizer bar between cam shaft levers is connected to a bell crank mounted on the left frame side rail, a wing nut adjustment being provided at this point. From the bell crank a rod is carried forward to the hand lever.



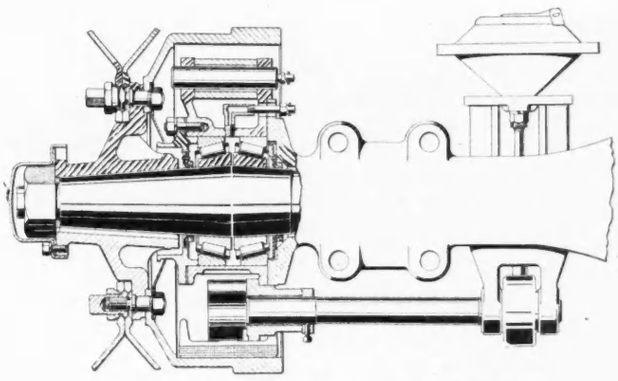
Propeller shaft center bearing with dual emergency brake

The tires used are twelve-ply balloons, 40 by 9.75, having a carrying capacity of 4400 lb. each. Dual tires are used on the rear wheels, the spacing being 11¼ in., although 12 in. spacing (which will allow the use of chains) can be employed without exceeding the 96-in. overall limit. The combination of 22-in. rims with 17¼-in. brakes gives ample air circulation space around brake drums, preventing overheating.

Rear springs are 64 in. long by 4 in. wide, which in connection with large balloon tires and Lovejoy shock absorbers (standard on the rear), give excellent riding qualities. Shackles are of the metal type, with 1½ in. pins, provision being made for adjustment to take up side play. Either single stage or two-stage



Front axle end with front-wheel brake



Rear axle end with air-operated brake

springs are supplied, according to load conditions.

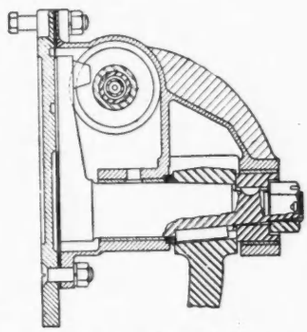
Front springs are 48 in. long by 3½ in. wide, and are shackled at the front end. Metal shackles are employed, with 1¼ in. pins, the same provision for side play adjustment being made as at the rear. The attachment of the front shackles to the frame is such that additional shock-absorbing devices may be installed without difficulty.

Some departures from previous practice in Yellow Coach frames are noted. The side rails are one-piece pressings of 5/16 in. carbon steel, the maximum depth being 11⅝ in., just back of the front spring rear bracket, from which point the depth decreases toward both front and rear. The top flange has a maximum width of 5 in. and the bottom flange of 4 in. Kickups are provided over both axles. At the rear, the frame is 44⅛ in. wide and at the front, 36⅛ in. Side rails are parallel for a considerable distance at both front and rear, the change in width taking place in a length of 90½ in.

Eight cross-members are used, four being large-diameter tubes and four specially designed pressed steel members. Three of the tubular members are brazed into cast steel end brackets which fit snugly between the channel flanges and are riveted to both top and bottom flanges as well as to the web. The fourth tubular member is butt-welded to forged steel and brackets which are securely riveted to the web of the side rail just back of the rear spring rear shackle bracket. The front cross tube is 4 in. in diameter and supports the front end of the transmission. The second tube is 3 in. in diameter and acts as a stiffener just back of the removable transmission rear support bar. The third is a 4-in. tube and is located practically in the center of the frame, where it supports the propeller shaft center bearing and brake assembly. The fourth tube is also 4 in. in diameter and carries the Lovejoy shock absorbers.

A wide-flanged pan member is used at the front end of the frame, being tied into the side rails by bolts used in securing the front end frame brackets. This member, in addition to stiffening the front of the frame, acts as a support for the trunnion bracket for the front end of the engine, and also supports the radiator. The second cross bar is a pressed steel member of flanged U section, and passes below the engine in line with the rear support. This member is securely riveted to the web and bottom flange of the side rails, and is also braced to the top flange by means of the engine rear support casting and the steering gear mounting bracket. This member gives unusual rigidity at a point where ordinarily the frame is dependent wholly upon the engine rear mounting for stiffening. A third pressed steel member, used to support the rear end of the transmission, is made up of a pressed channel cross bar attached to pressed end brackets by means of two bolts to each end. These bolts are located in the centers of cup shaped depressions in both cross bar and brackets, the cups being pulled into engagement with one another by the bolts, thus forming a very rigid joint. The fourth pressed crossed member is of flanged U section and is located on the forward side of the rear kickup, away from the rear spring front bracket.

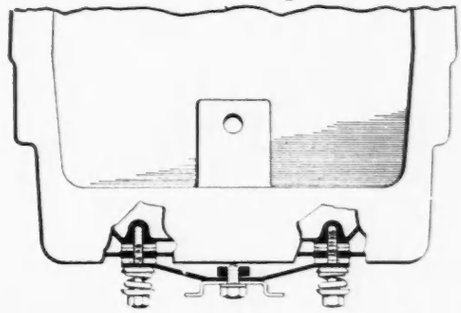
Another feature of this frame is the extensive use of bolts and nuts in place of rivets. All spring hanger brackets are fastened by means of ⅝-in. hand-fitted bolts, the holes being reamed with the brackets in place on the side rails. This assures a full bearing of the bolts in the holes, and practically eliminates the possibility of the brackets working loose. Large, flat washers are used under the nuts of all bolts, to distribute the load over the side rail as evenly as possible. Body outriggers, frame extensions and other attached parts are also bolted in place, to facilitate the servicing of the chassis.



Detail of steering gear, showing bearing on cam-lever shaft outside steering arm

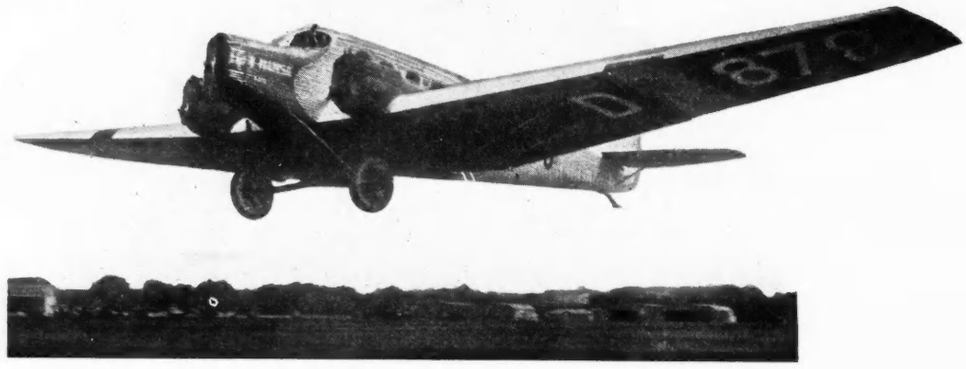
An unusual feature of the steering gear—which is of the cam and lever type—is the straddle-mounting of the steering drop arm. This is accomplished by extending the gear housing outwardly to form a boss beyond the drop arm which latter is keyed to a taper on the cam-lever shaft. The shaft is extended beyond the small end of the taper, to pass through the outboard bearing boss. The drop arm is held on the taper by a nut on the end of the shaft and bearing against a hardened steel sleeve which is keyed to the shaft and has its bearing in the extended boss of the gear housing. This mounting of the shaft prevents binding and cocking, and results in extreme freedom of motion in the gear. To reduce the unit pressure at the diamond point, the length of the cam lever has been increased. The housing is very rigid, and its mounting on the frame is such as to give unusual stability to the steering wheel. The use of a larger column tube than previously used further increases the wheel stability, and it is claimed that no bracing of the column to the dash or body is necessary. A 22-in. wheel is used with a wood rim and wide wood spokes.

Other features worthy of mention but which cannot be described in detail, are the five-piece hood, attachment of hood fasteners to reduce motion between hood and ledges, a simplified wiring system, and installation of the exhaust pipe on the outside of the left side rail.



Method of mounting radiator on frame

Subsidizing of *Aviation Industry*



Initiative assumed by Herr Sachsenberg, who is described as a very fervent apostle of the Junkers policy against the subvention of one company alone.

IN the leading European countries, civil aviation has been developed with the financial assistance of the governments. In England and Germany for a number of years, subsidies have been paid, in each case, to a single company. The governments evidently are convinced that unified control and operation on the largest possible scale give the greatest assurance of safe, reliable and economical service. For one thing, it eliminates wasteful competition, which is always likely to arise in a new and promising line of enterprise if the field is thrown wide open.

In England, Imperial Airways enjoys a virtual monopoly of air traffic, and in Germany the Luft-Hansa. These monopolies are assured solely by the subsidies, which cover a considerable fraction of the operating costs, for it would be suicidal for any unsubsidized firm to enter into competition with enterprises receiving government aid. The French Government at present is considering plans for the reorganization of commercial air services, and the formation of three companies, each limited to its own district, has been suggested.

While such a program of development through monopolies has advantages, naturally it does not suit every one, and it must be particularly objectionable to the aircraft industry in the respective countries to see their home markets thus artificially limited—in England to the government services, the Imperial Airways and the training schools, and in Germany to the Luft-Hansa and the schools. In Germany, this opposition to exploitation by a single company has found strong expression in an open letter by a Herr Sachsenberg, who is described as a more fervent apostle of what is there known as the Junkers policy (against subsidizing a single company) than even Prof. Junkers himself. We find a review of the Sachsenberg brief and of a public reply by the Luft-Hansa in *L'Aeronautique*, together with some comments by the editor of that paper. Sachsenberg makes the following contentions:

Before being able to do any useful work, an airplane must overcome the force of gravity; in consequence it operates always under more difficult conditions than other means of transport. For this reason, it should not attempt to enter into competition with them, at least not where they have been organized for a long time with a view to an economic efficiency materially higher than that of the plane. This holds for Europe.

But the airplane possesses qualities which render it suitable as a means of transport where the other services fail, or do not possess the required qualities in the same degree. These elements of superiority are as follows:

1. An airplane has no need for continuous roads.
2. Its speed is incomparably higher than that of any other means of transport.
3. Its itinerary is independent of topographical obstacles, and it can take the most direct route between any two points.

It follows from these specific qualities of the airplane that the future field of air transport lies in

1. International, intercontinental and transoceanic postal communications.
2. The transportation of passengers over distances of sufficient length to make the advantage of the high speed appreciable.
3. The transportation of heavy materials in districts possessing no other means of transport, the establishment of which would have been too expensive, either on account of natural obstacles to be surmounted, such as boggy plains and primeval forests (Africa and South America), or because of the apparent lack of a commercial future (vast desert areas of Asia, northern Africa and Australia).

Mr. Sachsenberg puts special emphasis on the importance of this latter class of outlets. According to him, it is only necessary to bring down the cost of air transport to 1.40 marks per kilometer-tonne (49 cents per ton-mile) to make it possible for the airplane to compete with burden carriers and with caravans. And this,

in Germany Evokes *Controversy*

he asserts, will be possible within the very near future, European companies having offered to realize this operating economy. Finally, Mr. Sachsenberg offers to institute a supervised experiment to prove the possibility of operating commercially at this low cost.

It results from the nature of the outlets enumerated above that the future of the (German) aircraft industry lies in export, and it is on this premise that Mr. Sachsenberg builds up his industrial program. In order to gain export business, it is essential to produce cheaper than foreign competition, which makes it necessary—

1. To incessantly improve the quality of German aircraft, by training engineers and pilots equal to that task, and by maintaining and endowing aeronautical research laboratories.
2. To lower the production costs of aircraft as much as possible, by improving methods of production and of shop organization, and by developing consumption so as to permit quantity production.
3. To develop exports of aircraft by suitable political and commercial action (propaganda, commercial treaties, etc.), by the payment of export bounties, and by the putting into effect of an adequate air-traffic policy.

Since the future of the industry lies in exports and the industry is as yet incapable of self-support, it should be given assistance particularly in that direction.

Mr. Sachsenberg holds that the export bounty is the most effective means of developing the industry, for it serves at the same time the interests of the manufacturers and those of the general public. It benefits all those manufacturers who do an export business—and these only—and those whose products meet the requirements of air traffic best will be favored most.

The general public interests would be helped by:

1. The increase in exports, which would improve the commercial balance with foreign countries.
2. Increased activity of numerous other branches of industry, which furnish the aircraft industry with raw materials and semi-finished products.
3. The propaganda exercised by German aircraft in favor of other German products and the possibility of maintaining an export business in numerous industries that are dormant at present.

The amount of the export bounty, according to Sachsenberg, should be from 30 to 35 per cent of the sales price, and should be guaranteed for a period of 10 to 15 years, the probable formative period of the international aircraft market. Thereafter the bounty should decrease over a number of years and should be suspended entirely when the aircraft industry, after having adopted itself to market conditions, is in position to do without it.

In parallel with his industrial program, and based on the same principles, Mr. Sachsenberg outlined an aeronautic policy. To him, the exploitation of the present air lines in Germany (which could not exist except with government support) is merely a large-scale experiment designed to lead to the improvement of aircraft and to the training of air service personnel. This is its only justification.

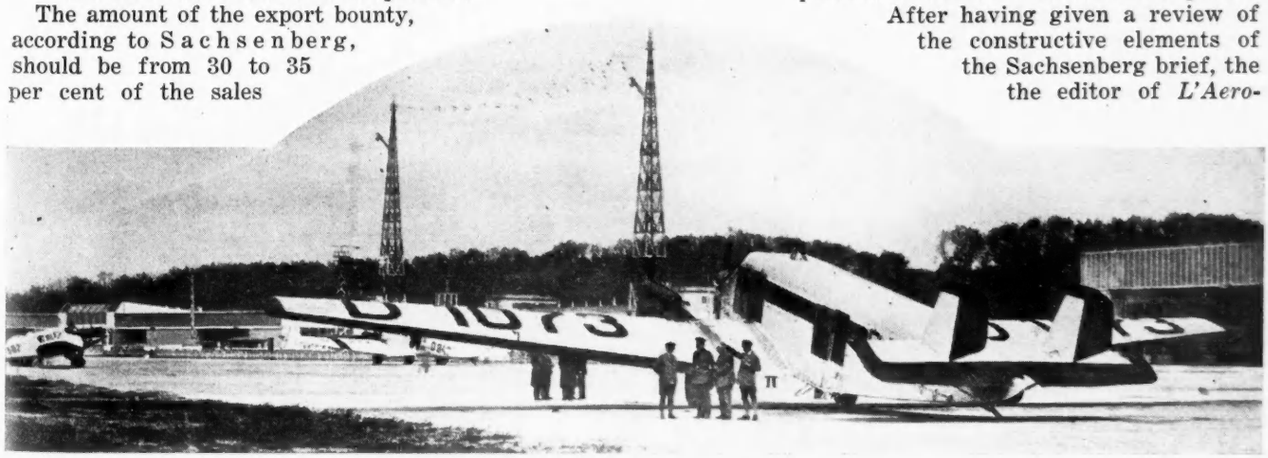
But it is absolutely unjustifiable (says Sachsenberg) that the government subsidies be limited to a single company, as is the case in Germany, and that the related branches of industry and commerce do not share in it, although they all help toward aeronautical progress.

Sachsenberg proposes that the national air lines be operated by the government, or by a subsidized company under government control, as well as the connections between Germany and neighboring countries; and that the organization of lines between Germany and distant countries be left to private enterprise without any government support whatever.

In explanation of this latter recommendation, he states that any government enterprise in foreign countries always meets with obstacles of a political nature, or at least with suspicion, which are not met with by enterprises supported solely by private capital and which have only commercial ends in view. A commercial enterprise of any kind, in order to be economically useful, must be able to exist solely on the remuneration received for the services which it renders. At the same time it has a right to demand that it should not be subjected to unfair competition from government-supported enterprises which can render services at "dumping" prices.

Finally, the government is not an industrial organization, and its actvities should be limited to assuring liberty of private enterprise, and the safety of transportation for the benefit of the public.

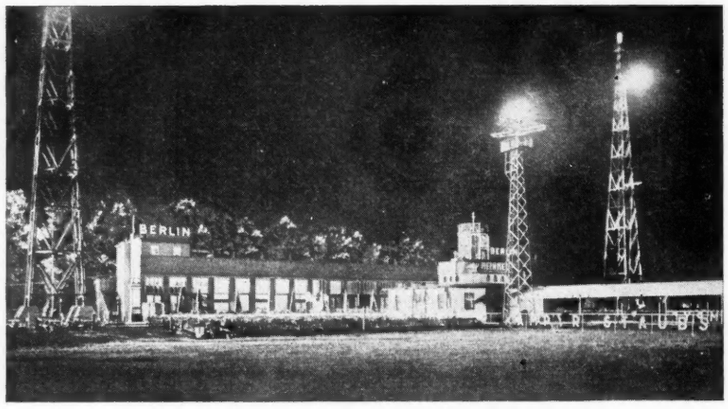
After having given a review of the constructive elements of the Sachsenberg brief, the the editor of *L'Aero-*



Luft Hansa passenger plane at Templehofer Field

nautique, in order to bring out clearly what Sachsenberg criticizes in the present regime, outlines the policy of the German Minister of Transport with respect to aircraft construction and operation.

As regards production of aircraft, the government authorities are of opinion that the industry should limit its production in accordance with the absorption capacity of the internal market, which is represented by the Luft-Hansa and the training schools, aside from the demand—necessarily very limited—for private planes.



Berlin central airport at night

The industry, of course, may accept orders from foreign sources, but the authorities hold that it would be very dangerous for it to increase its production capacity to normally satisfy this foreign demand, as outlets of this nature are subject to so many influences as to render their constancy problematical.

As the home demand, which amounts to about 6,000,000 marks per year, is far from being sufficient to support the German aircraft industry, and as this industry, unlike its foreign rivals, does not have the support of important military orders, the Minister of Transport has provided supplementary orders for new types of airplanes.

The result of this policy is that the industry survives with difficulty, although heavy charges are imposed on the public, and the Luft-Hansas and the schools are forced to absorb a quantity of material exceeding their real needs, and which sometimes does not conform to their requirements. This means heavy supplementary maintenance charges and amortization, which in part explains the difficult conditions under which the Luft-Hansa operates (5.30 marks per ton-kilometer or $2 per ton-mile).

As regards the service, the system adopted is that of a single company subsidized by the government, the Luft-Hansa since 1926. This system is justified by the desire not to waste the funds appropriated by the government in useless competition between a number of subsidized companies.

The authorities assert, moreover, that they plan to return to a system of complete economic liberty as soon as air services are self-supporting. But since aviation has no commercial future except in export, and since the Luft-Hansa, which is handicapped by being a government-supported organization, does not seem to be particularly anxious to get into export buiness, it looks very much as though its momentary monopoly were in a fair way to perpetuate itself. Its foreign activities, moreover, are rather less efficient than those of the services which preceded it.

After having painted this dismal picture of an aircraft industry which cannot exist on the sparse nourishment of insufficient orders from the government, and of a commercial air service which (according to him) is failing in its essential duties, Sachsenberg concludes that the official policy must necessarily fail.

A reply has been issued by the Luft-Hansa in which the complaints and suggestions of Sachsenberg are taken up point by point. The company claims that it is impossible for airplanes to replace burden carriers and caravans in regions where there are no other means of transport, and that it is impossible to lower the cost of transport by airplane to about 1.50 marks per ton-kilometer. It is denied that the installation of a flying service between Bouchir and Chiraz, Persia, with 40 flights per day, pointed to as a promising project by a specialist in Oriental economic matters quoted by Mr. Sachsenberg, would be practical. To further emphasize the difficulties which attend the use of aircraft for commercial transport in undeveloped countries, the Luft-Hansa mentions the German-Turkish Air Co. (a Junkers subsidiary), which failed recently. Finally, the Luft-Hansa holds that if aircraft should succeed in developing traffic in any district, it would lose this traffic again to other, less costly means of transport, such as the railroad, as soon as the density of transport warranted the investment of the necessary capital, "for the high speed of the airplane is of no particular benefit in the case of the majority of passengers and of the bulk of the goods requiring transportation."

The editor of *L'Aeronautique* thinks that in replying to Sachsenberg point by point, the Luft-Hansa hardly did itself justice, and that it could have built up a far stronger case for itself if it had elaborated the advantages of unified control.

Emergency Brake Lever

A NOVEL arrangement of the emergency brake lever is suggested in a U. S. patent recently issued to Austin M. Wolf of Newark, N. J. Mr. Wolf mounts the lever in the usual position but so that, instead of moving in a vertical plane parallel with the fore and aft axis of the vehicle, it moves in a plane making an angle of 20 deg. with that axis.

With the emergency brake lever in its usual location, to one side of the longitudinal axis of the vehicle, in order that ample clearance be allowed for the gear shift lever, and in a plane parallel to that axis, one's pull becomes less the farther the lever is drawn back, due to the lever's being to one side. The muscles of the arm become less powerful as the arm becomes extended and cranked (in plan view) and a point is reached where muscular energy is applied at a great disadvantage.

With the arrangement suggested, the pull on the lever is directly toward the shoulder. Furthermore, one is able to throw the inertia of one's body (from the hips up) and the muscular energy thereof on the lever, besides the arm muscular energy. When using both brakes simultaneously, the brake pedal becomes a brace, and the maximum thrust in opposite directions comes on the pedal and lever.

Broad *Code of Ethics* for *N.B.M.A.*

ADOPTION of a Code of Ethics, with the indicated assurance of the full approval of the Federal Trade Commission, by the National Battery Manufacturers Association, featured the close of convention held by that body in Cincinnati last week. In addition to the adoption of the Code of Ethics, the association pledged every effort to enhance dealer prosperity, endorsed a plan to establish uniform battery test standards, uniform data book, super-service station policy and pledged cooperation between the oil, tire and battery industry. Among the speakers were David Beecroft, vice-president of the Bendix Corporation; D. H. Kelly, vice-president, USL Battery Corporation, and W. E. Humphrey, commissioner of the Federal Trade Commission. The Code of Ethics follows:

THE ideals of men best project themselves into reality when crystallized in written documents. In every line of human activity, a written expression of what is best for the common good becomes a strong force for progress. The mere expression clarifies the general sentiment. Nowhere is a formation of principles more needed than in business.

The National Battery Manufacturers Association offers the agency through which the forward-looking leaders of business can crystallize the conscience of our industry. Through the Association united effort is possible to rid an industry of unfair and harmful practices. The members of the National Battery Manufacturers Association covenant and agree with one another of the National Battery Manufacturers Association as follows:

I. Our mutual interests can be best served through cooperation with one another, and our aim shall be and our efforts directed toward such mutual exchanges of general matters of like interest that each, through the experience of others, may profit thereby and avoid the loss entailed by others.

II. We shall refrain from and discourage the practice of disparaging a competitor's product, personnel or his business, financial or personal standing, and shall endeavor to prove to our competitors that we are as sincere and honest in all matters as we could wish them to be.

III. In the realization that higher business standards and greater efficiency are to be attained through the proper use of knowledge received in an exchange of experience, we shall maintain an open mind and give due consideration to the opinions of others.

IV. We shall endeavor to maintain such a friendly relationship with competitors as will enable us to meet with them and discuss frankly the means of furthering our mutual interests.

V. We shall not resort to bribery or other means of persuading each other's or customers' employees.

VI. We shall not attempt to procure a breach of competitors' contracts with customers by any means whatsoever.

VII. We shall not simulate in our own product the trade mark, trade name, slogans, advertising matter of a competitor or otherwise attempt to imitate a competitor, so as to obtain advantage of the good will he has established.

VIII. We shall not combine with competitors to raise or maintain or bring about uniformity in prices, to divide territory, or to allot customers.

IX. Selling below cost for the purpose of injuring a competitor, or with the effect of substantially lessening competition, is an unfair method of competition. A fair profit should be made on all transactions.

X. We fully recognize that our Association has been formed not merely to advance the interest of the members and the industry at large, but for the purpose of promoting sound business relations with allied industries and with the public, and that the Association can effect the purposes for which it exists only to the extent that it receives our active and constant support. We accordingly pledge ourselves to aid in carrying out the work of the Association, by financial contributions, by personal service, and by personal interest and cooperation to our utmost in aiding our Association to accomplish the purposes for which it has been constituted.

XI. We shall avoid scrupulously all overstatements or misrepresention of any kind in our behalf, either in advertising or in personal salesmanship.

XII. We shall refuse to pay bribes or "commissions" to buyers, purchasing agents, or others, who thus may be induced to place orders with us. Secret rebates to customers or donations to customers' salesmen will not be allowed to further the sale of our products.

XIII. We shall not use unethical means to hire away a competitor's employees.

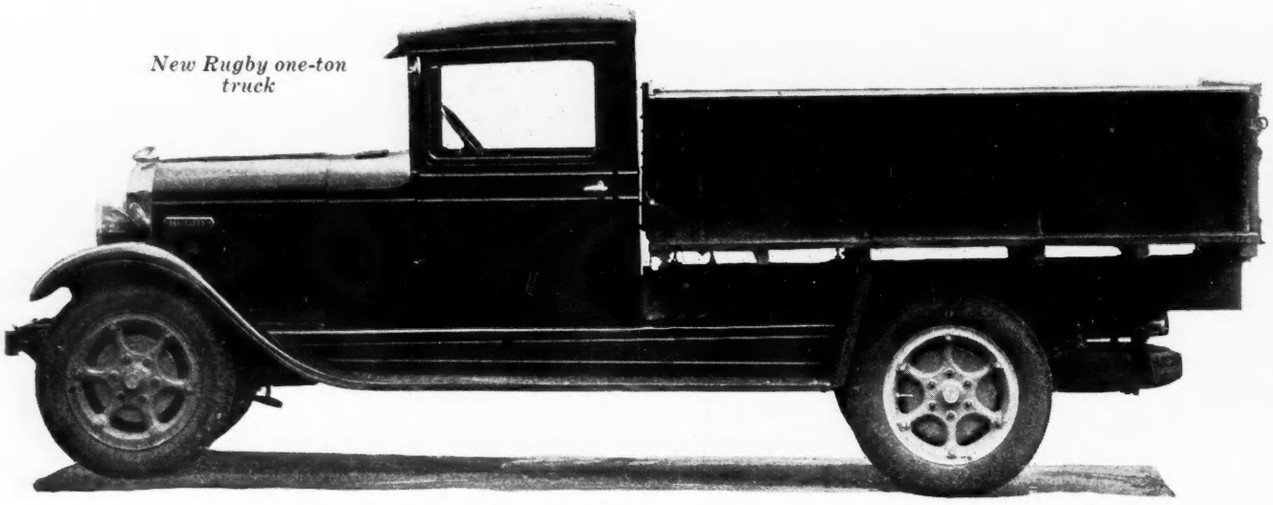
XIV. Since our Association is conducted for the advancement of the interests of all its members, we shall view all questions acted upon as in the interest of all, and to the best of our ability endeavor to regulate our acts according to them.

XV. When rumors or statements reach us, which tend to reflect upon the intentions, acts, or purposes of another member, we shall question their correctness and feel free to frankly communicate with the Association for the purpose of ascertaining the facts.

XVI. We shall be cautious in the purchase of equipment to increase our productive capacity and give due consideration to whether the demand for our product has been permanently increased so as to justify such additional equipment.

XVII. We shall not make up or disseminate false cost sheets. The members recognize that in manufacturing and selling, costs should be accurately determined and carefully considered. A scientific cost system, uniform as far as practicable, will be used in arriving at the calculation of all costs which the members submit to the Association.

XVIII. We agree to carry out the provisions of this Code of Ethics and any infractions to be reported to the Committee on Ethics of our Association, with power to take such action as is found necessary by the membership.



New Rugby one-ton truck

Rugby One-Ton Truck by Durant Has Two-Speed Rear Axle Unit

Four-cylinder engine remains basically unchanged, although design alterations have been made to increase the power output. F.O.B. price is $775.

A TWO-SPEED rear axle is the outstanding feature of the new one-ton Rugby truck of Durant Motors, Inc., the Model 401. It lists at $775 f.o.b. Lansing, Mich., and has been strengthened considerably in its parts as compared with the former Durant Model X, which it replaces. With the two-speed rear axle and a three-speed gearset, six forward speeds are obtained, and the four-speed transmission of the Model X is no longer used.

While the four-cylinder powerplant remains basically unchanged, the bore and stroke being 3⅜ by 4¼ in., a number of changes in design have been made to increase its power and improve it in other ways. The compression ratio has been raised to 4.75 to 1, and a larger Tillotson carburetor is used, which together account for an increase of 10 per cent in the maximum torque. Another new feature in the engine is the provision of interchangeable crankshaft bearings.

The same clutch is continued, while the new three-speed transmission, which is located amidships, has a ball bearing main shaft and gives a low-speed reduction of 3.32 to 1. It is driven from the clutch through a Spicer rubber-ball-type universal joint.

A Spicer propeller shaft with two metal universal joints transmits the power from the transmission to the rear axle. The latter is a semi-floating, bevel-gear type, and to the front of the center housing is bolted a two-speed change gear. The additional speed reduction which may be effected at this point is obtained through an internal gear assembly.

Basically, the design is analogous to that used in the four-speed Durant passenger car transmission. The internal gear ring is mounted in the case and carried by two external roller bearings. It is in constant mesh with the gear teeth on the driveshaft, the latter also mounted on roller bearings with a double-row ball pilot at the front. Engagement of the pinion shaft with either the internal gear ring or the driving shaft is by means of internal and external teeth on a sleeve splined to the pinion shaft. This arrangement is similar to that used in the Durant four-speed transmission, with one-third the number of teeth on one gear as on its mate. The gear with the full number of teeth has every third tooth longer than the others, so that if complete engagement does not take place during 40 deg. of travel between each two long teeth, the latter will act as a stop and guide for the mating gear to permit completion of engagement.

Compared with conventional spur gear engagement, the time element for the shift is, of course, three times greater, since in that case the maximum angular motion of the shift is limited to the pitch line backlash plus the tooth chamfer. The shock of engagement, which is in proportion to the difference in velocity of the moving parts, which in this type of unit can be quite considerable, of course, might be too great for a single tooth to handle, but the six large teeth on the shifter sleeve have been found to be ample for carrying the impact at high road speeds. To prevent abrasion, the sleeve teeth on the pinion shaft and cup gear are hardened.

An interesting shifter control also has been worked out for this unit, which is said to overcome the possi-

bilities of engagement or disengagement through "walking." This has been obtained by carefully working out an idler lever installation and the spring ride, and by providing a spring cushion control at the rear end of the shift rod. This spring is so designed that movement of the shift lever does not result in any movement of the shifter fork, until the proper spring pressure has been built up, thus preventing the inertia of the long shift rod and shift lever from throwing the gear out of engagement in case of an unusual combination of forces, as in striking a hole and applying the brakes simultaneously.

Lubrication of all parts of this axle have been given careful consideration. A trough is built into the main axle housing to collect oil from the rotating ring gear. This oil flows through a large diameter, cored hole in the two-speed reduction housing to the forward end of this unit, from where it runs back by gravity to the differential case, sufficiently large passages being provided to prevent building up of oil pressures at the front end of the case, which might result in leaks.

The pinion shaft is straddle-mounted on ball bearings in this axle, with differential and axle shafts on Timken taper rollers. The gear ratio of the spiral bevel gear reduction alone is 6.1 to 1, while with the internal gear reduction it is 9.25 to 1, giving a total range in forward speed reduction from 6.11 to 1 in complete direct, to 30.7 to 1 in low. The tread is 56½ in., with 39 in. between spring centers.

Front axles are considerably heavier in the 401 than in the Model X, with oval sections at the wheel ends for brake torque reaction. King pins are also ⅛ in. larger with larger bushings. A heavier worm and sector steering gear with 15 to 1 reduction is provided.

Bendix two-shoe brakes have been adopted on the new one-ton truck, with 13 by 1¾ in. front, and 14 by 2 in. rear drums. All four brakes are operated by either pedal or hand lever, a single cross shaft being provided on domestic and double cross-shafts on export models. These Bendix brakes, of course, have molded lining, and are self centering.

Springs are semi-elliptic all around, 36 in. long and 1¾ in. wide at the front, and 45 in. long and 2½ in. wide at the rear. Cast metal wheels with 30 by 5 in. tires are standard equipment. The wheelbase is 132 in., and the turning radius 23 ft.

A 10-gal. fuel tank is mounted as usual below the seat, and a Stewart vacuum-feed system is provided. The radiator is of the cellular type, with a water capacity of 9 qt., a 16-in. fan driven by a Vee belt, and water pump circulation. Chassis lubrication is by Alemite fittings.

The weight of the chassis is 2350 lb. and the body allowance 1000 lb. Cabs are furnished if desired.

Controlling Torsional Vibration of Crankshafts

(Continued from page 687)

The rubber driving members must not be regarded as friction-clutch disks but rather as members of a dog clutch, for the steel plate is not clamped firmly between the rubber disks but is driven by means of buttons on them extending into holes in the steel disks. For an eight-cylinder vertical engine of about 200 cu. in. displacement a disk of ¼-in. steel 8½ in. in diameter gives the necessary damping action.

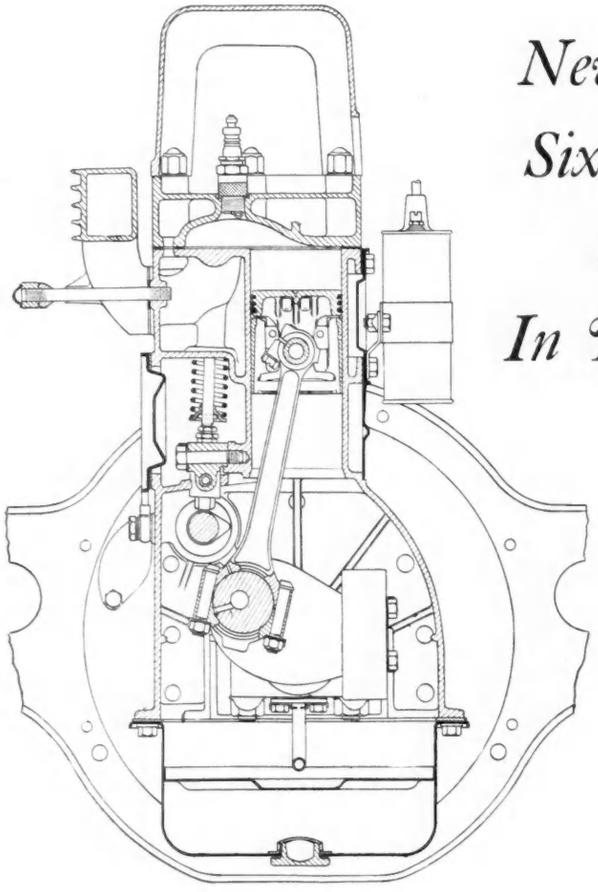
There is evidently one important difference between dampers in which the damping members are arranged as in a disk-type clutch or a friction shock absorber, and those in which an elastic-plastic body is deformed. In the first the friction is a constant item and there is no damping action until the angular acceleration of the forward end of the crankshaft (in torsional vibration) reaches a certain value. With an elastic medium distortion is substantially proportional to the distorting force and, practically speaking, any change in the angular speed of the crankshaft whatever will result in a damping action. Thus there will be some damping action at least for every harmonic within the operating range. Fluid friction dampers share this same characteristic, since any acceleration or deceleration of a vessel partly filled with fluid will cause the fluid to be set in motion (unless it is exceedingly viscous).

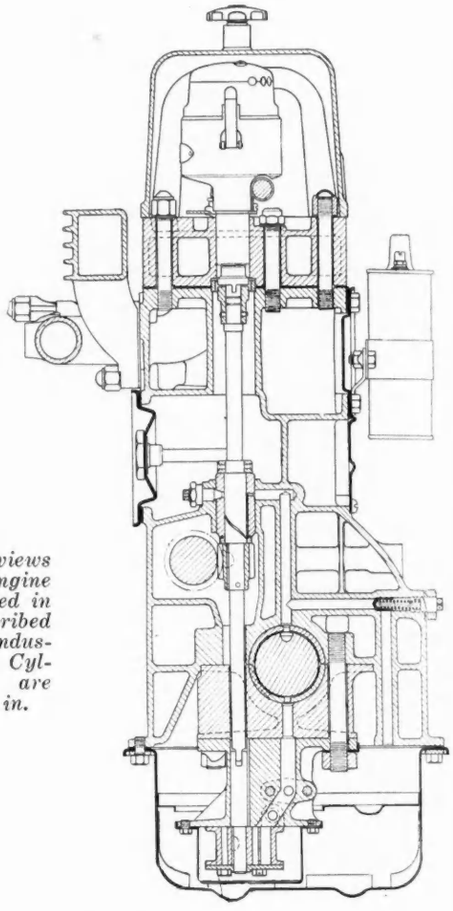
The harmonic balancer, which is used on a number of General Motors cars, in its latest form is shown in Fig. 4. It is combined with the fan drive pulley, which is mounted at the forward end of the crankshaft outside the crankcase. The pulley is keyed to the crankshaft and is provided with four studs projecting from it laterally. These studs serve to drive an inertia member on the crankshaft through multiple-leaf laminated springs. When the crankshaft begins to vibrate torsionally, the inertia member also will acquire a periodic motion, but owing to its inertia and the method of its connection to the fan pulley, its motion will be out of phase with that of the driving member, the fan pulley. The result of this will be constant deflection and rebound of the leaf springs. It is claimed for the harmonic balancer that it eliminates torsional vibration at all engine speeds.

Fred Duesenberg, vice-president of engineering of Duesenberg, Inc., has invented a torsional vibration damper in which mercury is being used as an inertia and frictional medium. Owing to the fact that a patent application on the device is pending, it is impossible to print full details, but it can be stated that the device comprises capsules mounted on the crank arms, which are partly filled with mercury. When there is torsional vibration the mercury is caused to surge in the capsules, and it appears that the fluid friction of the mercury, which is increased by the provision of baffles, furnishes the damping action. When a quantity of fluid is thus set in motion in one direction, then stopped and set in motion in the opposite direction, all of the energy which it has absorbed in being speeded up in one direction is dissipated in heat. This energy is proportional to the mass of the fluid, and since mercury has a high specific gravity, a powerful effect can be obtained with it without bulky apparatus. The energy dissipation is also proportional to the square of the speed, hence the damping action should vary with the speed as required to damp out the different harmonics.

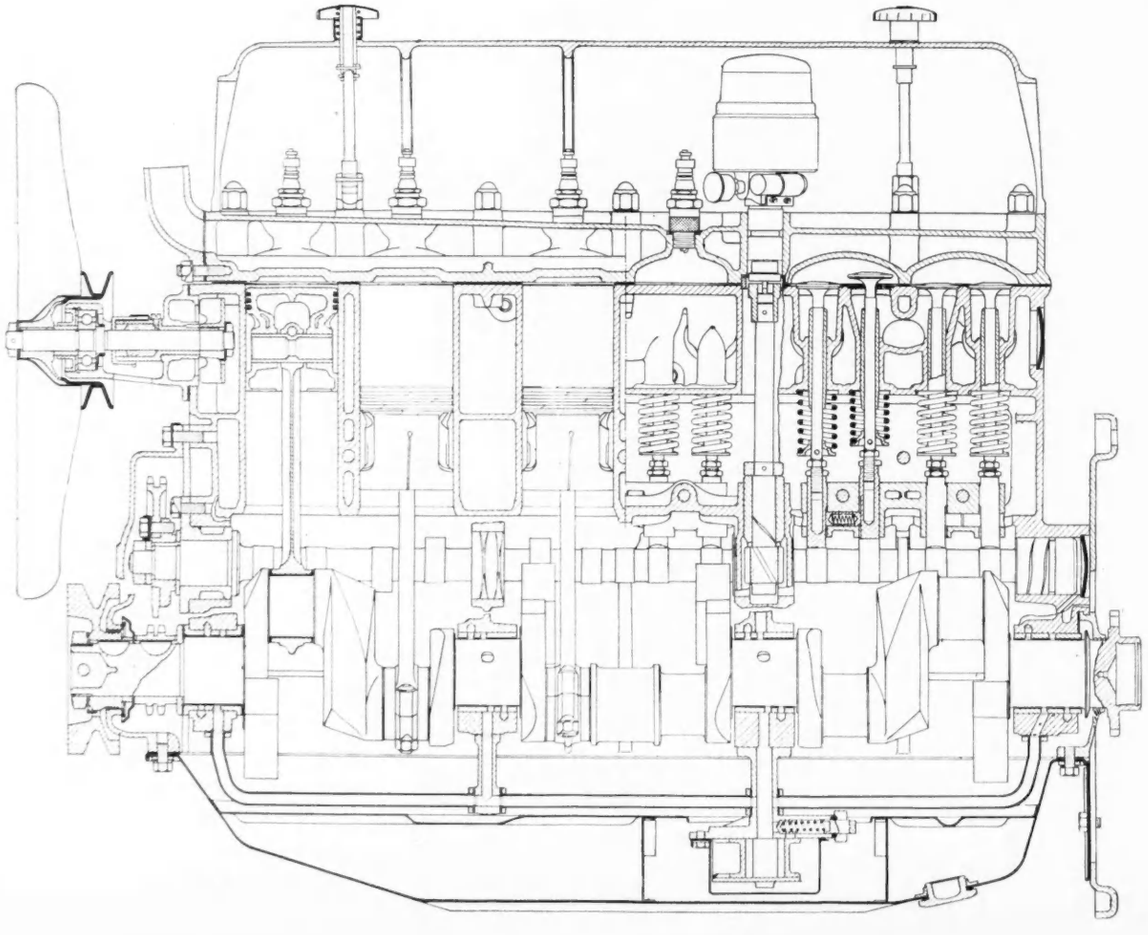
Theoretically it would be possible also to produce a damping effect by electro-magnetic induction, but so far this principle does not appear to have been utilized. A floating permanent magnet forming a nearly closed circuit could be used, with a narrow annular space between its poles into which the rim of a copper drum might project. The magnetic drag, of course, would not be so easily adjustable as the friction in the conventional damper, but, on the other hand, there would be no wear, and once properly fitted to the engine no adjustment would be required. In case of loss of magnetic strength, the magnets could be remagnetized. However, the bulk and cost of the device may be such as to render it impractical commercially.

New Citroen Six-Cylinder Engine In Production





Detail sectional views of the Citroen engine now being produced in the new plant described in Automotive Industries of March 23. Cylinder dimensions are about 2⅞ by 4 in.



British Motor Car Output in 1928 Was Principally in Small Types

Decline in production caused by reaction after two unusually good selling years, general business depression and limited garage facilities

IN the accompanying tables are presented some interesting data concerning motor vehicle output in Great Britain during 1928. There is, in England, no sure source of information such as our Department of Commerce, so that the *Motor Trader*, which published these figures, has made them up from registration data furnished by the Ministry of Transport and from production returns from individual car makers.

The data apply only to British cars and it may be seen that 1928 production was somewhat less than for the two previous two years. In explanation *Motor Trader* offers three causes: First, the reaction after the unusually good selling years of 1926 and 1927; second, the generally depressed condition of British business, and third, the lack of adequate and cheap garage accommodations.

Imports continued strong during 1928, but as these were mainly in the higher horsepower ratings—17 to 25 hp.—where relatively few British cars are to be found, they are not considered to have been very influential in the reduced market for 1928. Both the high horsepower tax and the petrol duty have driven British manufacturers to the production of cars with low expense appeal.

The extent to which this has been carried out is seen in one of the tables where it is shown that during 1928 nearly 85 per cent of British cars produced were rated at 14 hp. or less. In the 25 hp. or over class, where most American cars are to be found, total British production for the year was less than 1000.

Total imports into Great Britain during 1928 were about 32,000 cars and 2100 trucks. Re-exports totaled 2000 cars and 79 trucks and exports of British vehicles totaled 26,000 cars and 6500 trucks.

As has been true for several years the two largest manufacturers in Great Britain are Morris Motors and the Austin Motor Co. These two concerns produce about 80 per cent of all cars built and therefore hold about the same relative place in the British industry as do General Motors and Ford in this country. The remaining 20 per cent of production is divided up among a much larger number of makers than is true in the United States.

About 85 per cent of the cars sold in Great Britain were of British manufacture but British exports were about the same as imports so that total home consumption was approximately equal to production or about 155,000 cars and 52,000 trucks.

To illustrate further the extent to which British production is spread among a great number of concerns only a few of which turn out any considerable number of cars, *Motor Trader* has compiled a table showing the number of companies producing cars in the various horsepower classes. These classes are the same as those shown in Table 2.

Thirteen firms produce cars in the 10 hp. or less class to make up to the total class production of 50,856 and 11 of them built more than 1000 cars each. In the next class about 53,000 cars were built by 13 firms, five of which produced more than 1000 cars. In the 25 hp. class, seven concerns produced 926 cars during 1928.

Table I—Seven Years of British Car Production

	No. of Cars Produced	Value in £
1922	38,000	20,500,000
1923	67,000	24,000,000
1924	107,000	36,500,000
1925	133,500	41,566,000
1926	158,699	43,161,945
1927	161,920	43,550,561
1928	154,495	38,763,946

Table II—Car Production in 1928, 1927, 1926

Analyzed According to Hp. Categories

	1928		1927		1926	
	No.	Value £	No.	Value £	No.	Value £
10 hp. and less	50,586	7,915,250	38,992	6,470,310	32,875	6,195,420
12 hp.	51,915	10,371,781	69,966	14,905,366	82,452	18,325,560
14 hp.	27,052	7,513,500	32,115	9,843,050	31,797	9,996,085
16 hp.	12,398	5,341,390	11,220	5,309,260	3,901	2,203,065
18-25 hp.	11,618	6,302,400	8,654	5,617,875	6,350	4,595,315
Over 25 hp.	926	1,319,625	973	1,404,700	1,324	1,846,500
	154,495	38,763,946	161,920	43,550,561	158,699	43,161,945

Table III—British-Made Cars

Average Prices 1928, 1927 and 1926

	1928		1927		1926	
	Average Price £	Percentage of British Output	Average Price £	Percentage of British Output	Average Price £	Percentage of British Output
10 hp.	156	32.6	165	24.2	188	20.7
12 hp.	199	33.5	213	43.2	222	52
14 hp.	277	17.4	306	19.8	311	20
16 hp.	430	8	473	6.8	590	2.3
18-25 hp.	542	7.5	649	5.4	723	4
Over 25 hp.	1,425	.6	1,443	.6	1,394	.8

German Commission's *Gas Tax* Study *Involves* Special *Policies*

Definition of motor fuel, allowance for fuel used other than on the highways and distribution of funds discussed in conference with N. A. C. C.

By A. B. CROFOOT

EXACTLY what is a motor fuel? How widely is this material used for purposes other than transportation over public roads? Where this is taxed for highway maintenance, from whom should the taxing authorities collect? What does it cost to install and administer a gas tax? What authorities shall control the expenditure of monies thus raised?

These are a few of the questions in the minds of the commission now visiting this country from Germany for the purpose of studying the American gas tax.

Together with a number of similar questions this formed the basis of a two-day discussion at the headquarters of the National Automobile Chamber of Commerce last week. It was at the invitation of this body that this commission, consisting of members of the German government, representatives of chambers of commerce and industrial organizations, is now in this country making a detailed study of our American system of road building and maintenance, particularly our schemes of financing these operations.

Members of this commission had their own ideas as to the answers to some of these questions as they apply to the German problem. Nevertheless their presentation at this two-day conference which was attended by representatives of the American petroleum industry, the automotive industry, motor fleet operators and students of political science, was one of the objects of this visit.

The definition of a motor fuel is particularly important in consideration of the German problem, as the practice of the industry there differs widely from that of this country, and some of the products used are handled in limited quantities and are difficult for authorities to check accurately. For this reason the commission asked about the practice in this country with regard to a number of substances not generally considered here motor fuels. R. C. Holmes, president of the Texas company, answered this question by quoting the various state laws in their definition as used in the gas tax laws. Finlay G. Crawford, however, professor of political science at Syracuse University, adopted a definition particularly suited to the German problem as follows:

"Motor vehicle fuels are such fuels known as gasoline and such other volatile and inflammable liquids produced or compounded for the purpose of operating or propelling motor vehicles, except the product known as petroleum and except alcohol." Alcohol is excluded because the presence of 26,000 distilleries would create an undue administrative problem in the opinion of the chairman of the commission.

As to the general proposition of whether a tax on fuel is desirable, which fact seemed to be somewhat in doubt in the mind of the members of the commission, H. H. Rice, of General Motors Corporation and chairman of the taxation committee of the N.A.C.C., expressed the American point of view in the following words:

"Those who favor the gasoline tax believe that it is the only form of automobile tax which takes into account the distance traveled, weight and speed of vehicle. Furthermore, it is easily and cheaply collected and they believe that it is a fair measurement of the amount of money that a motor vehicle should pay for the use of the roads. In addition, it requires the tourist from one state to pay a fair charge for the use of the highways of another state which he has not helped to build by the payment of registration fees."

One question that weighed heavily on the minds of the commission was that of making allowance for fuels used other than on the highways. A large number of mobile internal combustion engines in Germany are used in agricultural work (a much larger percentage than in this country) and these engines never use the public highway. Then too there is wider industrial use of some of the substances used there for fuels than there is here for gasoline. These two conditions introduce the question of exemptions even more strongly than here. The commission was therefore much interested in the application of exemptions and the cost of administering them in this country, being them-

PROPOSED GERMAN GAS TAX LAW

By Professor Finlay G. Crawford, Syracuse University

1. Tax of (open) per gallon.
2. Motor fuel to include all volatile substances except alcohol and petroleum.
3. Gross receipts tax.
4. License fee for importers and producers.
5. Returns made monthly.
6. Refunds to users other than for transportation.
7. Exemption by permit to aircraft companies, dye establishments, dry cleaners and manufacturers using motor fuel.
8. Decrease of motor vehicle license tax for commercial cars.
9. Distribution to provinces on basis of motor vehicle registrartiton. Each city to get its full share.

selves of the opinion that this would cost nearly 5 per cent of the revenues raised. It was shown, however, that according to the experience in this country this cost of administration ran about 2 to 2¼ per cent.

The total cost of administration, according to American experience, has been low. Fraud has not been so freely indulged as to create a serious drawback to the system of raising revenues for road construction and maintenance. William L. Dill, Commissioner of Motor Vehicles for New Jersey, told the conference that 90 per cent of the sales made in his state were honest.

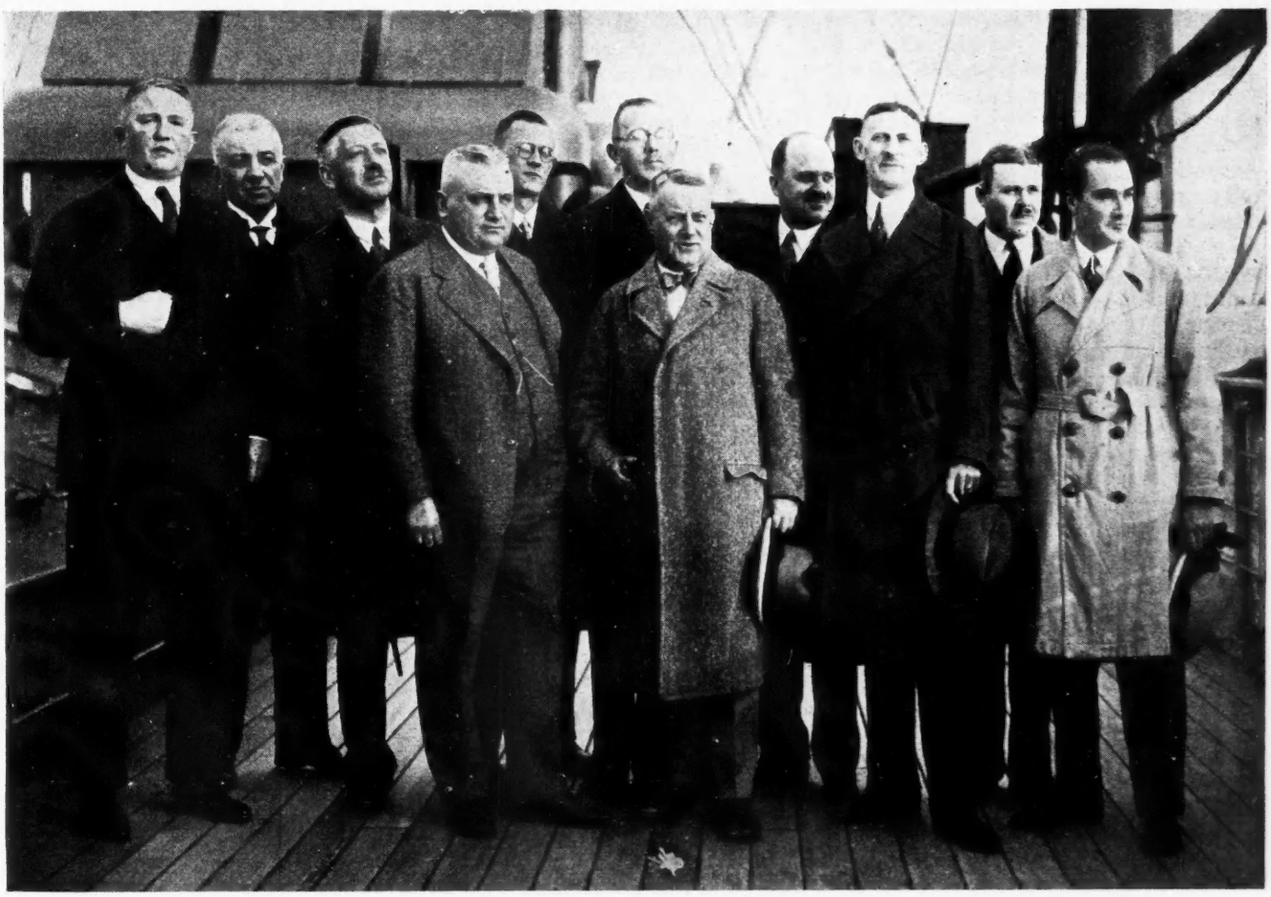
On the question as to the immediate source of this revenue the commission showed some hesitancy toward approving the generally accepted American plan of collecting the tax from the distributor. While a large portion of the fuel used in Germany is imported and it would be a relatively easy matter to collect the tax directly from the importers, it was the consensus of the members of the commission that this would work considerable of a hardship on the importers since it would tie up their capital until this tax was in turn collected by them from the retailers, and would thus entail additional costs in interest charges to these importers.

The commission was inclined to disagree with the American policy as to distribution of the funds raised. With very few exceptions the state controls the expenditure of practically all the money raised by the gasoline tax here, the feeling being that most of the traffic on our country roads is generated in the cities and that the cities should therefore be responsible for a large share of the maintenance costs of country roads as well as their own streets.

The Germans did agree that funds thus raised should be used exclusively for construction and maintenance of roads, but they felt that the cities should be apportioned a share of the money for construction of their own roads. They will have one advantage over us, if they do adopt a gas tax, as theirs will be a national law and uniform throughout the country and will be subject to no variation between states as is the case here.

In calling attention to the fact that revenues from gasoline taxes in this country last year amounted to $300,000,000, which together with $325,000,000 from registration fees and a probable $50,000,000 from New York and Illinois, which completed the list of states levying a gas tax this year, will bring the estimated income from drivers to $700,000,000 this year, Mr. Rice pointed to two dangers involved in this type of tax. These are (1) that the rate may become too high; and (2) the possibility of diverting funds to purposes other than highway development. As has already been pointed out, the whole conference was agreed that the second of these possibilities should be discouraged. As to the first danger, the following comment by Mr. Crawford will perhaps give the clearest picture of the situation:

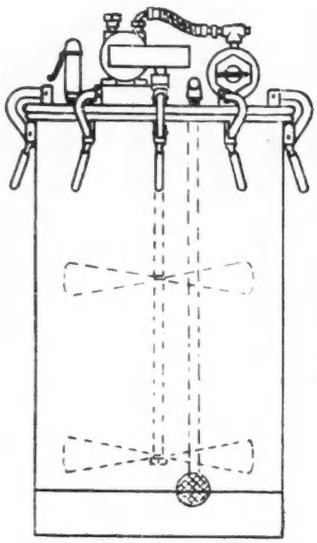
"It has been the experience of the American states than an increase in the tax secures a proportional increase in revenue. In other words, advances in the rate have not affected gasoline consumption. This has worked out up to the five per cent tax, which has been levied in ten states. Where the point of diminishing returns will be reached has not been determined, but it is probably around the five-cent mark."



Above is shown the German delegation which arrived here last week to study American gasoline taxation methods. The party was led by Dr. Robert Allmers (extreme left) head of the Hansa Lloyd Automobilwerke

New Developments—Automotive

Paasche Pressure Tank



THE Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, has brought out a new stationary pressure tank for automobile and other large finishing production jobs. They are furnished in sizes from 6 to 60 gal., and with all sizes Airmotor agitators are available. The covers of the tanks are fastened by clamps with no nuts or bolts to tighten or any wrenches necessary. Each clamp is adjustable with washer shims for proper tension and when once set it tightens uniformly.

Heavy Duty Carburetors

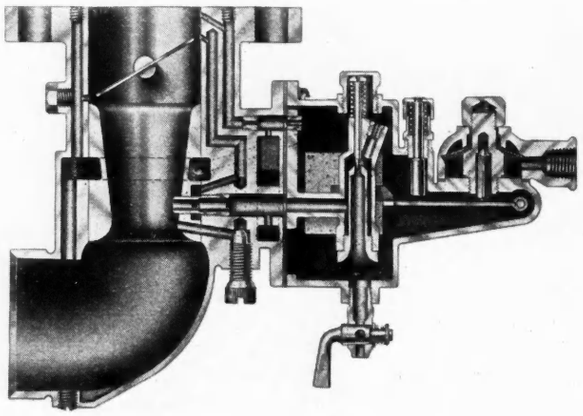
A NEW carburetor, designed specifically for heavy duty work, such as on buses, tractors, marine and the stationary power units, is being introduced by the Ensign Carburetor Co., of Los Angeles and Chicago.

Good economy is said to be obtained throughout the open throttle range by the use of a large air bleed to the main jet, and, at part throttle, by means of a connection between the carburetor mixture passage and the balancing system. The latter is so located that when the throttle has opened to a certain point, this connection is brought into action by the throttle passing the port shown to the left of the throttle valve, thus applying the manifold pressure reduction gradually to the fuel chamber and retarding the flow of fuel through the needle-valve-regulated orifice. This regulation is provided to assure the correct load mixture.

The balancing connection mentioned is said to give protection against change of the mixture by any air flow resistance ahead of the carburetor air intake, such as through the use of an air cleaner, the main air intake being the only opening in the carburetor to atmospheric air.

An unusual method of fuel feed to the accelerating well is noted. The upper of the two ports to the right of the throttle valve imparts a suction to the accelerating well surrounding and connected to the main horizontal fuel passage from which the well is filled, and into which it discharges. This suction is dependent on the metering orifice at the left of and modified by the fixed orifice to the right of, the connection of the port with the well. Fuel discharge on acceleration is through the lower of the upper two right-hand ports, taking the fuel directly from the main fuel passage.

For idling, the fuel feed is through the same port as for acceleration, but it is controlled and adjustable by means of the screw valve and air bleed shown below the main fuel jet, thus giving an independent control system. Fuel flow through the well by-pass should be very small owing to the small regulating and relatively larger metering orifice provided in their passage.



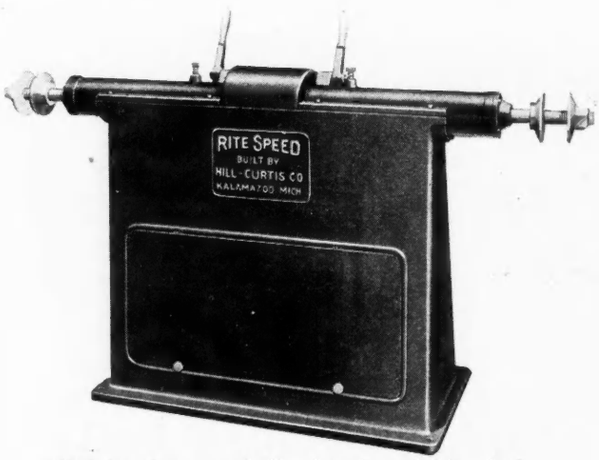
Sectional view of the Ensign carburetor

The long lever arm on the float valve mechanism helps to maintain a correct fuel level at considerable angles of carburetor inclination.

Hill-Curtis Polishing Machine

HILL-CURTIS CO., Kalamazoo, Mich., has developed a two-spindle electric polishing machine having two independent spindles, two motors mounted in the base, and two separate starting switches and brakes. Power is transmitted to the spindle by means of a Multi-V belt and each motor and spindle can be started and stopped independently of the other and each spindle can be operated at a different speed.

The machines are equipped with the Hill-Curtis combination switch and brake, which eliminates the possibility of applying the brake before cutting off the current. Tapered roller or ball bearings are optional. Any standard stock motor can be furnished. The com-



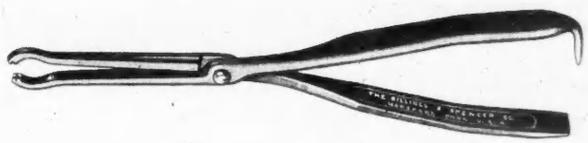
Hill-Curtis two-spindle electric polishing lathe

Parts, Accessories and Production Tools

bination switch and brake with automatic motor starter having thermal overload protection is standard equipment. Machines are made in 3, 5 and 7½ hp. capacity for alternating or direct current.

Cotter Pin Tool

THE Billings & Spencer Co., Hartford, Conn., have developed a valve and cotter pin tool for inserting, spreading and pulling cotter pins. The jaws hold the cotter pin for inserting; the flat beveled extremity of the handle spreads the pins, and the hooked extremity



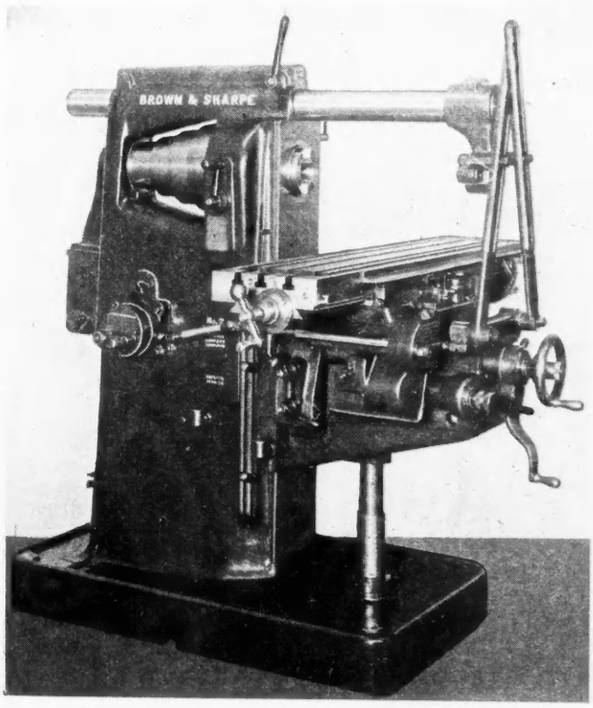
Billings & Spencer valve and cotter pin tool

on the right pulls the pin out. The jaws are suitable also for valve work, and will help slip in washers where ordinary pliers haven't the reach. The tool is of forged steel, 9½ in. long and is finished in black lacquer.

B & S Milling Machines

THE Brown & Sharpe Mfg. Co., Providence, R. I., has added a No. 2 standard universal and a No. 2 standard plain milling machine to its line. Both are of the cone drive type and are designed particularly for tool room and light manufacturing work. A fast and slow series of spindle speeds are available with the slow series obtained through back gears engaged by a lever on the left-hand side of the machine. Two operating positions are provided with all levers controlling the operation readily available from either position. All changes in the power feed of the table are made by rotating either of the feed change levers located at the front-of-table and rear-of-table operating positions. One revolution of either lever accomplishes a change of speed.

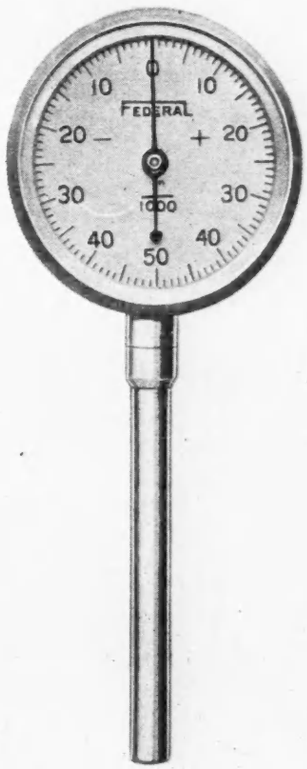
Filtered oil is automatically supplied to all bearings within the column by a plunger pump. A gage on the side of the column indicates the pressure. Another pump automatically lubricates the knee mechanism while a large well at the front of the saddle oils the complete saddle mechanism and the table bearings. Accurate vertical adjustments are made possible by a one-piece knee elevating screw which is completely enclosed in a steel sleeve and does not extend below the base of the machine. The overarm is firmly clamped at two points by a single lever at the front of the column.



B & S No. 2 standard milling machines

Federal Dial Indicator

FEDERAL PRODUCTS CORP., Providence, R. I., has developed a Model 80 Junior dial indicator for general precision measurements. The model is similar in construction to Model 80, but is much smaller in diameter, being 1 23/32 in. in diameter, with a holding bar 2⅜ in. long by ¼ in. in diameter. The gage can be furnished with or without jewel bearing movement as preferred. Racks are chromium plated and the movement is a separate unit assuring perfect alignment. The stem is cast integral with the case, and the entire movement can be removed for cleaning or repairing.



Federal Model 80 Junior dial indicator

First with the News

Reliable, Accurate

News of the Industry

PAGE 708 VOLUME 60 *Philadelphia, Saturday, May 4, 1929* NUMBER 18

April Output Is Likely To Set All-Time Record

PHILADELPHIA, May 4—With many of the quantity producers of automobiles reporting a record output for April, it is not improbable that complete figures on production last month will reveal a new all-time record in the history of the industry. Automobile executives declare that a strong retail market exists which fully justifies the stupendous rate of production. It is further stated that the condition is so favorable that several manufacturers plan to equal—and in a number of cases exceed—the April output during the month of May. However, the belief is held among some students of production trends that a slackening in output is likely to be noted during the latter part of this month.

While it would appear that large stocks of cars are on hand, executives in many instances indicate that retail sales are considerably ahead of the factories' manufacturing capacity. Some of the larger producers, notably Chevrolet and Hudson-Essex, report their stocks in the field as far below normal. The Chevrolet Motor Co., which set a new all-time record with 157,000 cars in April, will attempt to exceed the 160,000 mark this month, and the Hudson Motor Car Co. announces that it will maintain a peak production schedule throughout this month.

The present high rate of new car sales has naturally resulted in large numbers of used cars coming into dealers' hands, but reports reaching factories from various sections indicate that the demand for cars of this class is also good and that there is no serious backing up of used car stocks. Several of the larger companies have launched aggressive campaigns to urge dealers to make every effort to keep used cars moving in a favorable ratio with new car sales. Dealers in several parts of the country have responded with special campaigns to keep their used car stocks moving.

Detailed reports from the factories on April production appear on page 713.

Ellet Succeeds Taylor

DETROIT, May 2—R. J. Taylor, who for the last fifteen years has been general purchasing agent of the Hupp Motor Car Co., has resigned his position effective May 1, according to an announcement made by the company. J. W. Ellet, assistant purchasing agent, who has been with Hupp for 16 years, succeeds Mr. Taylor.

Graham-Paige Increases Prices on Its Model 612

DETROIT, May 2—The Graham-Paige Motors Corp. has increased the list prices of its 112-in. wheelbase Model 612 on all but two body types. The company announces that the scheduled production of this model in May calls for 1500 more cars than were built in April, when the company set a new all-time record for production on all models.

New prices on the 612, at the factory, and the amounts of increases follow: Four-door sedan, $955, increase $20; Two-passenger coupe, $955, increase $20; coupe with rumble seat, $1,005, increase $20; roadster, $970, increase $35; phaeton, $970, increase $35; two-door sedan, $895, no increase; cabriolet, $1,025, no increase.

Chapman Joins Hayes

DETROIT, May 2—William H. Chapman, comptroller of the Durant Motors plant at Lansing for several years, has joined H. J. Hayes Industries, Inc., as comptroller.

Citroen Officials Coming

NEW YORK, May 2—M. Paul Vavon, chief engineer, and F. A. Schwab, general manager of Societe Anoynme Andre Citroen, will arrive in this country on the Ile de France on May 6.

Baldwin Buys Michigan

DETROIT, May 2—The Baldwin Rubber Co., Pontiac, has purchased the Michigan Rubber Co., Owosso, which it will operate as a unit.

Report Edsel Ford With Chemical Firm

NEW YORK, May 1—Edsel Ford is reported to be one of the members of the board of directors of the American Interessen Gesellschaft Chemical Corp., recently organized under a Delaware charter, to manufacture and distribute in this country the products of the I.G. Co. of Frankfort, Germany. These products will include synthetic gasoline, fertilizer, silk, dyestuffs, solvents and lacquers.

Moto Meter Transaction With Safe-T Announced

NEW YORK, May 1 — Terms of stock exchange whereby the newly organized Moto Meter Gauge & Equipment Corp. will acquire the business and assets of Moto Meter Co., Inc., and of the Safe-T-Stat Co. have been announced. Each share of Safe-T-Stat common will receive one share of the new stock, while each share of Moto Meter Class A will be entitled to ⅝ of a share of new common stock.

Holders may also purchase shares in the new corporation at $32 a share on the basis of ¼ share of the new stock for each share of Safe-T-Stat now held and ⅜ of a share of new stock for each Moto Meter Class A held. Stockholders of both stocks must deposit their shares with the Central Union Trust Co. on or before May 8 for the consummation of this exchange.

Construction is Begun on Ford Pacific Plant

LOS ANGELES, May 2—Construction at the new Ford Motor Co. plant at Los Angeles-Long Beach harbor started a few days ago with the driving of test piling preliminary to actual construction of footing on which the plant will rest.

Permits totaling $757,200 issued several weeks ago cover this work. No new permits have been issued since that time though others must be taken before the plant can be completed.

Waukesha Making Great Six Engine

Company Adds to Its Plant After Record-Making Six Months

WAUKESHA, WIS., May 1—The Waukesha Motor Co. has started production of its new 300-hp. Great Six engine which is designed to operate either as a gasoline or kerosene-burning engine, and to burn Diesel fuel by the Rector system. The engine also is so designed that it can be operated on the regular Diesel cycle, if provided with suitable equipment.

The last six months were the largest in the company's history, it is announced, with sales running more than 75 per cent ahead of the corresponding period a year before. Additions to plant and equipment, involving an expenditure of $1,300,000, have been completed. The company reports the largest volume of specifications for this time of the year in its history, with April specifications calling for 7485 engines. Twelve new customers have been added to the company's list in the last three months, including three long-established tractor companies.

United Aircraft Obtains Stout Air Line Service

NEW YORK, April 30—United Aircraft & Transport Corp. has acquired Stout Air Lines, Inc., operating regular passenger service between Detroit, Chicago and Cleveland. The Stout concern is headed by William B. Stout, chief of the airplane division of the Ford Motor Co. Announcement of this acquisition was made by Fred B. Rentschler, president of United Aircraft.

Foreign Cars, 7,585,000

NEW YORK, May 1—Motor vehicle registration outside the United States now equals 7,585,000, which compares with 7,585,000 in the United States on Dec. 31, 1919, according to the 1929 edition of Facts and Figures of the automobile industry published by the National Automobile Chamber of Commerce, out today.

Annual Meeting Date Set

NEW YORK, April 30—The Third Annual Meeting of the Motor Bus Division will be held at the Lafayette Hotel, Buffalo, N. Y., July 1 and 2. Following the custom of the past two years, the meeting will be held in conjunction with the Annual Meeting of the American Automobile Association which is scheduled for the same time and place.

Stutz Has Record Month

INDIANAPOLIS, April 29—Col. E. S. Gorrell, president of the Stutz Motor Car Co. of America, Inc., has announced that orders on hand show an increase over those of a year ago of 22 per cent while April shipments of Stutz and Blackhawk cars have exceeded those in April, 1928, by 162 per cent. This indicates the biggest month in the 18 years' history of the company, according to Col. Gorrell. Total shipments for this year exceed those of last year by 134 per cent, while export shipments have increased 126 per cent, the president stated.

Kinner Financing Plan to be Announced Soon

LOS ANGELES, May 2—Directors of the Kinner Airplane and Motor Corp. are expected to make a definite announcement in the next few days setting forth a new plan of refinancing for the company.

This plan is now being worked out with Bayly Brothers, fiscal agents, and the same Eastern bankers that were associated with the plan that was recently evolved and later discarded at a meeting of the stockholders.

The refinancing is to provide for expansion of factory facilities at the plant to take care of increased orders for motors. In January the plant moved to new quarters and it is now necessary to build a 9340 sq. ft. addition.

Curtiss Tests Prestone

NEW YORK, April 30—Prestone, the new cooling agent developed by the United States Army Air Corps, and previously described in *Automotive Industries*, has been tested in several airplane engines by the Curtiss Flying service, in conjunction with the Air Corps. Engineers of the Curtiss Aeroplane & Motor Co. bear out statements recently made in favor of the cooling process.

Durant Appoints Clark

DETROIT, May 1—J. M. Clark, formerly with the Federal Motor Truck Co., has been appointed Durant district manager for New York City and the surrounding territory. Prior to 1907 Mr. Clark was associated with various automobile companies in Germany and France, including Mercedes and the Delauney-Bellville.

Oakland Expanding Plant

DETROIT, April 30—An addition, 120 by 455 ft., is being made to the plant of the Oakland Motor Car Co. at Pontiac. The addition will cost $128,000 and will lengthen the motor plant from its present 880 ft. to 1000 ft. The company has just completed an addition to its assembly plant and work is now progressing on a truck garage 70 ft. by 200 ft. which will be used for the company's service equipment.

Hansen to Build

CHICAGO, May 1—The A. L. Hansen Mfg. Co., manufacturer of automotive hardware, will erect a three-story addition to its plant here at a cost of approximately $30,000, providing 25,000 sq. ft. of additional floor space.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, May 2—During the last week it was unusually cool in many sections of the country for this time of the year, and trade in the rural districts especially received a slight setback. As spring progresses the jobbing trades are becoming quiet. However, it still remains true that business on the whole is decidedly better than a year ago.

FREIGHT CAR LOADINGS

Railway freight loadings for the week ended April 13 totaled 971,730 cars, which marks an increase of 59,071 cars over those in the corresponding week in 1928 and an increase of 22,169 over those in the corresponding week in 1927.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 27 stood at 96.7, which compares with 96.7 the week before and 97.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended April 24 were 3 per cent above those in the corresponding week last year.

STOCK MARKET

The stock market last week exhibited a rising tendency, but suffered a slight setback in the latter part of the week, when the call money rate reached as high as 16 per cent. A general weakness developed with the advance in the call money rate, and many of the advances in the earlier part of the week were wiped out. After four successive weeks of advances, brokers' loans in New York City increased $67,000,000 in the week ended April 24. Total brokers' loans in New York City on April 24 amounted to $5,492,000,000, as compared with $4,144,000,000 a year ago.

FEDERAL RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 24 did not indicate any striking changes. There were decreases of $19,800,000 in holdings of discounted bills, of $11,600,000 in holdings of Government securities and of $12,200,000 in member bank deposits. There was only a slight increase in holdings of bills bought in the open market. The Reserve ratio on April 24 was 74.3 per cent, as against 73.3 per cent the week before.

Banigan Succeeds Comings

PHILADELPHIA, May 1—At a meeting of the National Automobile Show and Association Managers in Detroit recently, Leon F. Banigan, editor of *Motor World Wholesale*, was chosen secretary of that organization to succeed A. V. Comings, whose resignation made that position vacant.

Steel Mills Enter Highly Active May

Demand for Automobile Sheets Continues; Prices Appear Fixed

NEW YORK, May 2—Steel mills have entered their busiest May in many years. Usually May is an off-month in the steel industry, ushering in the first signs of mid-summer dullness, but not so this year. New business is slightly easing, but most producers are not very eager for additional business at this time. Third-quarter sheet demand is reported as favorable, especially for full-finished automobile sheets. There is little likelihood at this time of any marked change in the price structure of the sheet market, producers as well as consumers apparently satisfied with prevailing levels, but, so far, no flat announcement has been made that the present $4.10 price on full-finished automobile sheets applies to third quarter business.

Compared with full-finished sheets, fairly prompt deliveries are obtainable in common black and blue annealed sheets. Many small buyers have been compelled to obtain their sheet requirements from warehouses. Plant extensions of finishing mills are likely to ease pressure on production facilities later in the year. Demand for soft steel bars from automotive consumers is well maintained. Cold-finished steel bars also move in good tonnages. Automotive alloy steel inquiries for third quarter are encouraging.

A leading producer of high-speed tool steel announces an advance of 5 cents a pound on all deliveries made after July 1, and on orders and contracts made from now on. The advance was caused by the increased price of tungsten. Ordinary tool steel is firm. It is expected that demand for both ordinary and high-speed tool steel will expand as summer buying of machine tools by the automotive industries gets under way. Demand for wire from wire-wheel manufacturers is well maintained. The price for wire rods was not affected by the recent upward change in semi-finished steel prices, remaining at $42.

Pig Iron—A good deal of third-quarter business is expected in the next few weeks. Large automotive foundries are believed to have contracted for sufficient iron to carry them through this quarter, but there are many smaller melters who will be compelled to piece out their stock piles. Detroit prices continue at $21 for malleable and $20.50 for foundry.

Aluminum—Foreign aluminum has been coming in of late in relatively greater volume. The market is steady and unchanged. Demand for piston metal continues to be a dominant market feature. Automotive foundries are mostly covered for their first half-year requirements, but there is much odd lot buying from remelters.

Copper—Although producers continue to quote 18 cents, delivered Valley, and 18⅛ cents, Middle West, some offerings of resale metal were in the market early this week at a fraction below those levels. The market for copper and brass products presents a more settled appearance, and routine buying is noted.

Tin—The market shows a slightly steadier tone, spot Straits being quoted at the beginning of the week at 44 cents.

Lead—A fair demand for spot metal is in evidence at unchanged prices.

Zinc—With less resale metal weighing on the market, a more steady tone prevails, but fresh demand is not very impressive.

Conference Reports on Wholesaling Problems

WASHINGTON, April 27—A better appreciation of the position of the wholesaler in distribution picture in relation to both manufacturer and retailer—and a clearer conception of the wholesaler's opportunities, advantages and limitations were major results of the National Wholesale Conference held in Washington yesterday and today under the auspices of the Chamber of Commerce of the United States.

The conference met first a year ago and at that time committees of wholesalers and distribution experts were assigned to the study and investigation of four outstanding wholesale problems: Wholesalers' Functions and Services; Economic Factors Affecting Wholesaling; Business Analyses; Credits, Sales Terms and Collections. The reports of these committees were enthusiastically received.

Prominent automotive executives participating in the conference included F. B. Caswell, vice-president of the Champion Spark Plug Co., Toledo, who headed the committee which compiled much valuable data concerning the existence and use of business analyses; Percy Stern, president, Inter-State Electric Co., New Orleans; Harry G. Moock and H. M. Ballard Co., formerly with the Hudson Motor Car Co.

Ford to Have Turkish Unit

BERLIN, April 25—Up to now the Near East has been supplied with Ford products from a plant in Trieste, Italy. Now, however, Ford has concluded an arrangement with the Turkish government and will erect a factory and assembling plant in a special free zone on the harbor of Stamboul. No duty will be levied on parts and raw materials brought into this free zone. Only the completed vehicles, tractors and airplanes brought into Turkey will be subject to a small duty. The plant is to supply all of southeastern Europe and western Asia.

Leeds & Northrup Building

PHILADELPHIA, May 1—The Leeds & Northrup Co., maker of instruments and heat-treating furnaces, has obtained 190,000 sq. ft., including 85,000 sq. ft. of floor space in a one-story building adjoining its present plant, and already has begun construction of a connecting wing.

Bohn Heads Project to Acquire Heywood

Airplane Starter Company to be Nucleus of New Alliance Group

DETROIT, May 1—A company has been organized by Charles T. Bohn, president of the Bohn Aluminum & Brass Corp., to take over control of the Heywood Starter Corp. as the nucleus for a new airplane alliance group. It is his intention to finance the new group and to supply management and organization.

It is understood that others prominent in the automobile and aviation parts field will be associated with Mr. Bohn in the new organization. The Heywood corporation has perfected a compressed air starter for airplane engines which has been generally accepted.

It is stated that several of the larger manufacturers are drilling their motors to carry the Heywood device as standard or special equipment. Such companies as Wright, Packard, Lycoming, Stinson, Buhl, Mahoney, Ryan-Siemen, Sikorsky, Comet, Kinner, Warner, Scarab, Waco and the U. S. Army and Navy departments have been using the Heywood starters for some time.

Sloan and Macauley Are on Exposition Committee

NEW YORK, April 29—Alfred P. Sloan, Jr., president of General Motors Corp., and Alvan Macauley, president of Packard Motor Car Co., have been appointed to the Industrial Committee to Spain, an advisory committee cooperating with the Barcelona International Exposition to open May 15, under the auspices of the King of Spain.

More than 15,000 square meters of space have been reserved by American automobile manufacturers, manufacturers of equipment and machinery, tires, merchandise equipment and other parts and accessories. The exposition follows closely the Barcelona automobile show, May 1 to 11, American exhibitors at which include Packard Motor Car Co., Auburn Automobile Co., Brockway Motor Truck Corp., International Motor Co. (Mack), Graham-Paige Motor Corp., Marmon Motor Car Co., Moon Motor Car Co., Nash Motors Co., Stewart Motor Corp., Stutz Motor Car Co. and F. B. Stearns Co.

Announces New British Car

WASHINGTON, May 2—Krolite, Ltd., an Edinburgh firm of automobile engineers and coach builders, has started production of a new automobile with a six-cylinder, air-cooled engine, says a report received this week by the Department of Commerce. The report says that the minimum price in Scotland will be about $2,160 and a special study of foreign and colonial market conditions is contemplated.

Exports, Imports and Reimports of the Automotive Industry for March of Current Year, and Total for Three Months Ending March, 1929

	Month of March				Three months ending March			
	1928		1929		1928		1929	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	...	$47,973,939	...	$75,759,013	...	$113,965,613	...	$181,156,374
Electric trucks and passenger cars	8	8,477	3	4,530	37	54,361	12	16,520
Motor trucks and buses except electric (total)	9,718	6,791,357	24,878	13,625,014	30,138	20,773,946	57,716	32,739,443
Up to one ton inclusive	7,121	3,556,879	18,954	7,911,041	23,891	12,119,459	44,223	18,718,209
Over 1 and up to 2½ tons inclusive	2,380	2,646,419	5,520	4,629,165	5,559	6,627,592	12,530	11,454,190
Over 2½ tons	217	588,059	404	1,084,808	688	2,026,895	963	2,567,044
PASSENGER CARS								
Passenger cars except electric (total)	40,184	28,217,985	51,504	35,021,773	85,774	62,713,972	109,355	76,736,084
Value up to $1,000 inclusive	31,394	16,714,628	38,915	19,842,544	66,128	36,131,719	80,428	41,244,397
Value over $1,000 to $2,000	7,681	8,829,426	11,140	11,810,487	16,817	19,456,184	25,580	27,652,146
Value over $2,000	1,109	2,673,931	1,449	3,368,742	2,829	7,126,069	3,347	7,839,541
PARTS, ETC.								
Parts, except engines and tires	...	....	...	....	...	....	...	....
Automobile unit assemblies	...	6,173,537	...	16,227,348	...	13,085,384	...	40,009,358
Automobile parts for replacement	...	4,218,018	...	7,642,452	...	11,781,057	...	24,445,728
Automobile accessories	...	783,938	...	1,242,789	...	2,129,364	...	3,037,436
Automobile service appliances (n. e. s.)	...	631,268	...	683,492	...	1,627,975	...	1,777,600
Station and warehouse motor trucks	2	3,238	10	11,737	20	31,769	33	52,795
Trailers	79	46,374	112	48,577	158	78,162	268	128,418
Airplanes, seaplanes and other aircraft	12	141,697	38	686,655	49	509,419	69	1,103,520
Parts of airplanes, except engines and tires	...	113,637	...	322,091	...	197,308	...	484,945
BICYCLES, ETC.								
Bicycles	260	7,298	712	17,824	1,357	36,751	1,708	43,851
Motorcycles	1,715	402,809	2,300	531,844	4,649	1,083,110	5,527	1,273,562
Parts, except tires	...	120,422	...	116,326	...	355,250	...	329,392
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and Semi-Diesel	22	70,952	47	86,703	105	209,492	294	262,944
Other stationary and portable:								
Not over 10 hp.	2,711	253,480	3,816	360,544	8,639	727,146	9,577	865,164
Over 10 hp.	159	90,073	343	185,325	607	246,100	1,045	548,513
Automobile engines for motor trucks and buses	1,268	234,673	2,295	293,650	3,365	423,735	4,895	605,606
Passenger cars	13,882	1,545,954	16,116	1,626,087	26,620	3,053,794	32,637	3,410,623
Tractors	8	6,584	135	19,572	110	37,339	310	85,257
Aircraft	25	68,642	66	207,026	39	108,763	122	484,923
Accessories and parts (carburetors)	...	352,587	...	472,943	...	818,281	...	1,146,747
IMPORTS								
Automobiles and chassis (dutiable)	43	124,329	29	89,134	97	288,395	114	261,882
Other vehicles and parts for them	...	49,458	...	128,750	...	113,098	...	338,534
REIMPORTS								
Automobiles (free from duty)	26	24,603	48	52,547	73	77,907	93	136,631

Burgess-Norton Expands; Will Introduce New Line

GENEVA, ILL., April 30 — The Burgess-Norton Mfg. Co., maker of B-N piston pins, announces that it will shortly introduce a complete line of all-steel engine valves to be distributed through its five warehouses to parts wholesalers.

In line with a large expansion program, the company recently purchased the clutch-plate business of the Brown-Lipe Gear Co. The machinery and inventory is being moved to Geneva. The line of clutch-plates will be added at once to the company's products. The company has begun construction of a new building to accommodate increased business in piston pins, valves and clutch plates.

Sterling Sales Up

MILWAUKEE, May 1—Sales of the Sterling Motor Truck Co., Milwaukee, for the first five months of the fiscal year beginning Nov. 1, 1928, were, 80 per cent above the same period a year ago, it is announced. Orders in March and April have been running 15 to 20 per cent in excess of deliveries despite capacity production schedules.

Crosley Tests Plane

CINCINNATI, April 30—Test flights were made here recently on a three to four-passenger monoplane built at the plant of the Metal Aircraft Co. for Powell Crosley, Jr., president of the Crosley Radio Co. The plane is an experimental model and on its test results will depend whether a new aircraft company with Mr. Crosley as head, will be formed.

Cutler-Hammer Growing

MILWAUKEE, May 1 — Cutler-Hammer, Inc., Milwaukee, manufacturer of electric controlling devices, has established a warehouse at Cleveland, with A. G. Pierce in charge. The main works at Milwaukee are running at capacity, it is announced. Shipments for the first quarter totaled $2,663,000, an increase of $457,265, or nearly 21 per cent, over the same period in 1928.

AC Sets High Mark

FLINT, MICH., April 30—The AC Spark Plug Co. reached its highest mark for replacement sales in the first quarter 1929—each month, in comparison with the same month a year ago, showing an exceptional increase, according to W. S. Isherwood, general sales manager, who added that sales in the first three weeks of April show an increase of more than 50 per cent over the same period last year.

Sales Increase in N. J.

NEW YORK, April 29 — New cars sold in New Jersey during March this year totaled 12,871 as compared with 11,095 for the corresponding month a year ago, according to Sherlock & Arnold.

Thompson Products Adds Space in Its Warehouses

CLEVELAND, May 1—To accommodate piston and piston pin stock added through the recent purchase of the Cleveland Piston & Mfg. Co., Thompson Products, Inc., of thic city, has completed an extensive expansion of factory branch facilities, according to H. C. Crawford, in charge of the company's branch activities.

The branches at Chicago, Newark, San Francisco and Toronto have been removed to larger quarters. Space at the Kansas City branch has been doubled. Mr. Crawford has announced that a new branch will be operating at Atlanta, Ga., in the near future.

To Open Truck Body Plant

SIOUX CITY, IOWA, May 1—The Omaha Standard Body Co. announces it will open a truck body plant in the Hawkeye Truck Co. factory buildings, which for several months have been used for storage purposes only. The corporation will continue manufacture at its Council Bluffs plant, shipping parts here for assembly. F. L. Hebard, former resident of this city, will return as manager of the local plant.

Pitcairn Appoints Council

PHILADELPHIA, April 30—Harold F. Pitcairn, president of Pitcairn Aviation, Inc., has announced the formation of an advisory council for his company, composed of prominent business men.

F. W. Adams Joins Owen-Dyneto Corp.

Leaves Biflex Products After Five Years in Executive Sales Post

DETROIT, May 1—Floyd W. Adams, who is widely known throughout the automotive industry, and for the last five years sales manager of the equipment division of the Biflex Products Co., of Waukegan, Ill., has resigned to become sales manager of the Owen-Dyneto Corp., of Syracuse, with offices in the General Motors Building, Detroit. Mr. Adams took up his new duties today.

Prior to his connection with the Biflex Products Co., Mr. Adams represented the Victor Mfg. & Gasket Co. of Chicago for eight years selling to automobile manufacturers.

Owen-Dyneto Corp. manufactures starting and lighting equipment, electric windshield wipers, battery regulators and other products. Ray M. Owen is president and Harry L. Bill is vice-president and general manager.

Chrysler Retires Notes of Dodge Brothers, Inc.

DETROIT, May 1—The Chrysler Corp. today retired the entire $2,750,000 of the outstanding five per cent serial notes of Dodge Brothers, Inc., which were assumed when Chrysler acquired the assets of Dodge Brothers on July 13, 1928, it was announced by B. E. Hutchinson, vice-president and treasurer of the corporation.

"Chrysler Corp. since July 30, 1928, also has reduced Dodge Brothers, Inc., six per cent gold debenture bonds, amounting to $56,705,000, by $1,000,000 through the operation of the sinking fund on this issue," Mr. Hutchinson said. "In addition to these retirements, there has been a reduction of $350,000 in the five and one-half serial gold bonds of the Maxwell Motor Corp.

"There now remain outstanding in the hands of the public only $895,000 of these bonds. During the last nine months there has been, therefore, a grand total reduction of $4,100,000 in the funded debt of the Chrysler Corp., which is equivalent to seven per cent of the funded debt existing as of July 30, 1928."

Metal Institute Elects

BUFFALO, May 1—At the recent annual meeting of the Pressed Metal Institute in Detroit, Lee O. Benner, sales manager, pressed steel division of the Motor Wheel Corp., was elected president, and Harvey S. Johnson, assistant sales manager of the Bossert Corp., Utica, vice-president. G. D. Shanahan, general manager of the Motors Metal Mfg. Co., Detroit, and W. H. Schomburg, vice-president of the Bingham Stamping & Tool Co., Toledo, were elected members of the executive committee. E. H. Christ, vice-president of the Stanley Works, New Britain, Conn., vice-chairman of the New England group, is a member ex-officio of the executive committee, with R. B. Britton, also of the Stanley Works, vice-chairman.

Dot Lubricating Sells Part of Its Business

CAMBRIDGE, MASS., April 29—The Dot Lubricating Equipment Co., of this city, has announced that it has disposed of its entire lubricating equipment business, automotive and industrial, to the Alemite Mfg. Corp., of Chicago, which will continue its manufacture and sale. The reason for this transaction, as explained by the Cambridge company, is the rapid growth of its fastener manufacturing business, in which it will hereafter specialize.

John C. Talcott

BUFFALO, May 1—John C. Talcott, chief engineer of the Pierce-Arrow Motor Car Company, died April 27, at his home here after five days' illness of pneumonia. He was born in Buffalo 42 years ago.

From the time of his graduation from Cornell University in 1909, Mr. Talcott had been associated with the Pierce-Arrow company. In 1919 he was placed in charge of all experimental development, and upon the death of Charles Sheppy he became chief engineer, in 1927.

Hudson Has 5000 Dealers

DETROIT, May 1—Courtney Johnson, general sales manager of the Hudson Motor Car Co., said today that the company now has more than 5000 active dealers in the United States and that 950 of these dealers were added to the Hudson organization during the last year. Mr. Johnson is preparing to leave within a few days for the Pacific Coast and plans to call on practically every Hudson-Essex dealer in California.

Wheel Firm Organized

COLUMBUS, OHIO, April 30—The Ohio Motor Wheel Co. has been chartered with a capital of 6000 shares of stock, for the purpose of manufacturing and distributing a patented wheel for automobiles and airplanes. The company will establish a factory in Columbus, the location to be selected soon. The incorporators are C. G. Geyer, C. G. Howard, the inventor and William A. Rubrecht.

Murray Corp. Earns $784,903

DETROIT, April 29—Murray Corp. of America and subsidiaries report net profit for the first quarter after all charges of $784,903 equivalent after preferred dividend to $1.45 a share on common stock. This compares with $391,000 after depreciation but before Federal taxes for the corresponding quarter a year ago.

Indiana Truck Adds Roadbuilder Model

New Vehicle Has Six-Cylinder Engine; Gross Weight is 20,000 Lb.

MARION, IND., April 30—An additional Roadbuilder model of truck, the Indiana Model 627AW, has been announced by the Indiana Truck Corp., a division of the Brockway Motor Truck Corp. of Cortland, N. Y. It is equipped with a six-cylinder 4 by 5-in. Wisconsin engine and has a rating of a maximum permissible gross weight of 20,000 lb. The wheelbase is 156¼ in. The engine develops 72 hp. at 2000 r.p.m.

A full-floating type rear axle with double-reduction gear drive is used. Internal brakes act on gunite drums on the rear wheels and are applied by a vacuum booster. These brakes are 18 in. in diameter and have linings 4 in. wide. A 14-in. disk brake mounted on the propeller shaft is lever-operated and serves as the emergency and parking brake. The transmission is of the unit-powerplant type and gives five forward speeds and two reverse. Normally the fifth forward speed is the direct drive, but if desired, the fourth can be made the direct drive and the fifth an over-drive.

The frame is made of heat-treated pressed steel members, the material having a tensile strength of 90,000 lb. p. sq. in. As on other Indiana trucks, a three-point mounting is used for the engine, radiator and cab. The dump-body equipment recommended for this model is an 81 cu. ft. steel dump body with straight sides and round bottom, with double-acting tail gate and center partition for batch work. It is 72 in. wide, 102 in. long and 19 in. high.

G. M. to Put Delco Assets in Bendix Aviation Corp.

NEW YORK, April 30—General Motors investment in the recently organized Bendix Aviation Corp. will be in the form of $15,000,000 in cash and assets or capital stock of the Delco Aviation Corp., recently organized subsidiary of General Motors to handle its aviation and ignition battery business. In return for this, General Motors will receive 500,000 shares of the 3,000,000 authorized no par common stock in the Bendix company.

The transfer of assets of the Delco Aviation Corp. carries with it the license for aviation purposes exclusively for five years, and non-exclusively thereafter, on its aviation patents, inventions and other licenses.

Omaha Standard Building

COUNCIL BLUFFS, IOWA, May 1—The Omaha Standard Body Company is building an addition, costing $25,000, to its plant here which will double its output of truck and bus bodies.

Automotive Leaders Confer With Hoover

Chapin Heads Group of Twelve to Discuss Highway Transportation

WASHINGTON, May 2—Twelve of the most outstanding executives in the American automobile industry who compose the Contact Committee of the National Automobile Chamber of Commerce arrived here today to confer briefly with President Hoover, Secretary of State Stimson, Secretary of Agriculture Hyde and others. The general purpose of their visit is to discuss ways and means for expanding world highway transportation. They are being escorted here by Alfred L. Reeves, of New York, general manager of the National Automobile Chamber of Commerce, and Pyke Johnson, Washington representative of the Automobile Chamber.

The executives will be introduced this evening at the annual dinner of the United States Chamber of Commerce, to be given as a part of the 17th annual meeting of that body being held here. Most of the executives will leave Washington after the dinner. The party is headed by Roy D. Chapin, chairman of the board, Hudson Motor Co., Detroit. Other members are A. J. Brosseau, president, Mack Trucks, Inc., New York City; Walter P. Chrysler, president, Chrysler Corp., Detroit; A. R. Erskine, president, Studebaker Corp., South Bend, Ind.; Edsel Ford, president, Ford Motor Co., Detroit.

Also: F. J. Haynes, president, Durant Motor Car Co., Detroit; Alvan Macauley, president, Packard Motor Car Co., Detroit, and president National Automobile Chamber of Commerce; C. W. Nash, president, Nash Motors Co., Kenosha, Wis.; H. H. Rice, assistant to the president, General Motors Corp., Detroit; F. A. Seiberling, president, Rubber Association of America; Alfred H. Swayne, vice-president, General Motors Corp., ew York, and John N. Willys, president, Willys-Overland, Inc., Toledo.

Ruxton Head in New York

NEW YORK, May 2—A. M. Andrews, president of the New Era Motors, Inc., returned to New York today from Los Angeles where he has been showing the Ruxton car. He intimated that he might possibly have further announcements about the car to be made some time next week.

Plymouth Names Parks

DETROIT, May 1—Robert M. Parks has been appointed director of advertising of the Plymouth Motor Corp. Mr. Parks joined the Chrysler advertising staff two years ago and previous to that had 10 years' agency and sales experience.

Production and Shipments in April

PHILADELPHIA, May 2—April production reports from all but a few of the leading automobile manufacturers are available as *Automotive Industries* goes to press. Among the companies whose reports are expected within the next few days, and which, therefore, do not appear in the following list are: the Ford Motor Co., Studebaker Corp. of America, Inc., Packard Motor Car Co., Jordan Motor Car Co. and the Gardner Motor Co.

Chrysler Motors Corp. reports that shipments in all divisions showed a gain in April of 26½ per cent over the same month last year. April shipments totaled 59,785 compared with 47,155 for April, 1928. All divisions shipped 182,521 cars in first four months of this year compared with 159,857, a gain of 14.3 per cent.

Chevrolet Motor Car Co. reports that, for the second successive month, it set a new all-time production record, turning out 157,134 cars and trucks. This compares with 135,832 in April, 1928, and with 147,274 in March, 1929, 121,249 in February and 86,178 in January, 1929. The company reports excellent conditions in the field and plans to build more than 160,000 units in May.

Cadillac Motor Car Co. shipped 4206 cars in April, an increase of more than 15 per cent over April of last year, according to president Lawrence P. Fisher. The April output also marks a healthy increase over March and Mr. Fisher stated that Cadillac-LaSalle shipments for the first four months totaled 14,159 or the largest first four months' business in the company's history.

Olds Motor Works announces shipments of 15,752 cars, a gain of 43 per cent over April, 1928, when shipments totaled 11,088. Total shipments of Oldsmobile and Viking cars from Jan. 1 to April 30 were 45,194, slightly more than 2000 in excess of shipments during the entire calendar year of 1925. The company reports that its May production schedule calls for 17,000 cars, of which about 3000 are to be Vikings.

Auburn Automobile Co. announces sales as 2515 cars, compared with sales of 2308 in March and of 1751 in April, 1928. The schedule for May calls for 3027 cars, which possibly may be raised to 3500, as the Connersville plant is rapidly approaching peak production. The company reports orders on hand to run its plants at capacity for 60 days.

Graham-Paige Motors Corp. reports that production totaling 11,550 cars set a new high record. Production for the first four months totals 36,834 cars, a gain of 72 per cent over the same period last year. Orders on hand at the factory for May call for 13,500 cars. The company's export shipments, not including Canada, last month were 1465.

Durant Motors, Inc., announces the production of 11,404 cars in its various plants in the United States and Canada last month. Of this number, 6550 were built at the main factory at Lansing.

Oakland Motor Car Co. reports the production of 36,384 Oakland and Pontiac cars last month.

Marmon Motor Car Co. reports shipments of Marmon Models 68 and 78 and Roosevelt cars as 6029, establishing a new all-time record for one month, according to A. R. Heiskell, vice-president. The April volume was 67 per cent greater than the previous record established in March, 1929, when 3604 units were shipped, and it represents an increase of 150 per cent over April, 1928, when shipments totaled 2406 cars. The company has entered May with the strongest unfilled order position in its history, Mr. Heiskel said.

Peerless Motor Car Co. experienced the biggest month in its history from the standpoints of shipments and retail sales, according to factory officials. During April, 1789 cars were shipped from the Cleveland plant, exceeding the previous all-time by 33 units, and the previous April record by 38 per cent. Sales at retail exceeded shipments and many orders for rush delivery are still on hand.

Hudson Motor Car Co. shipped 44,447 Hudson-Essex cars in April, the largest individual month the company has ever known. This brings Hudson-Essex production for the year to 152,495 which likewise is a record exceeding the same period last year by 33,058 cars. May will see a continuance of maximum production at 1900 Hudson-Essex cars a day.

Pierce-Arrow Motor Car Co. reports shipments as 1366 units, which is an increase of 129 per cent over shipments of 624 cars in April, 1928. The company announces unfilled orders totaling 2144 cars. The schedule for May calls for 1650 cars, an increase of 250 per cent over production in May, 1928.

Hupp Motor Car Corp. shipped 6118 units in April, according to R. S. Cole, vice-president in charge of sales. Of this number 324 were exported and 231 went to Canada. Hupp enters May with 2456 unfilled orders on its books.

Reo Motor Car Co. set a new all-time April record, according to C. E. Eldridge, general sales manager, when it shipped 5716 units, compared with 5277 in April, last year, and with 5277 in March. Half the April production was passenger cars and the other half Reo speed wagons.

Franklin Automobile Co. had the greatest month in its history with shipments totaling 1636 cars. This figure is 67 units in excess of March shipments, the previous record for a single month. It surpasses April, 1928, by 957 units, a gain of 141 per cent.

Willys-Overland, Inc., announces production and sales as approximately 40,000 cars, compared with 39,500 during April, 1928. Sales in March were 38,400 cars and production 35,000. The schedule for May calls for the production of 40,000 cars.

Buick Motor Co. built 11,198 automobiles last month, according to Arthur Sarvis, assistant general sales manager, who states that the company plans production of approximately 15,000 units in May.

Nash Motors Co. reports that shipments last month were the greatest in the company's history, exceeding April, 1928, by 92.6 per cent.

Higher Sales Are Expected for May

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rially to the wealth of that country.

Looking specifically at the immediate present in Germany, which has become a cynosure of American automotive activity, abroad, it would seem evident that developments there would be influenced temporarily by the recent unfavorable trend of the reparations negotiations in Paris and the appearance of a slight money pinch which has been cited as an example of the growing tightness of money throughout Europe. This was said to have resulted from the demands of the New York call market. That recalls references to our own credit situation in the United States, the lack of appreciation of which is said to have evoked last week the special bulletin by the National City Bank analyzing sources of credit instability and available remedies.

Another factor that may have a certain amount of bearing on the volume of automobile sales in the vast agricultural areas of this country, is the progress made by the special session of Congress on the subject of farm relief. Early enactment of a favorable statute doubtless would encourage the farmer and promote automobile sales in the agricultural districts, especially if assistance were given on this year's crops. Naturally, any such developments that foster sales will affect not only new car stocks but also those of used cars, which for the most part were reported as not being excessive for this period of the year.

Ford and Chevrolet have continued to lead the market, with Ford still unable to fill orders promptly in a few districts but being able to give delivery on most models and in most places within a week at the most. Chevrolet sales continue heavy, but are being exceeded in number in many places by Ford.

The Motor and Equipment Association predicted that although a number of parts and accessory manufacturers were maintaining heavy schedules in April, some recession was to be expected this month which would continue during the remainder of the second quarter.

The detailed reports on the automotive market situation in various parts of the country follow:

Detroit

Record automobile sales which have been the order in Michigan since the first of the year appear to have shown a still further increase in April and dealers enter May with every confidence that next month's volume will be still greater. Excellent employment conditions which exist in the automobile plants throughout the state combined with general prosperity, have been major factors in the big demand for cars. Reports indicate that new car stocks in dealers' hands are at a minimum. There has been a quickening demand for used cars and while dealers have taken in large numbers on used vehicles in trade there is no dangerous stock of used cars on hand. In many principal centers of the state, dealers are cooperating in putting on used cars selling drives with the idea of keeping stocks well balanced.

New York

Retail sales during April are running well ahead of sales for the corresponding month a year ago, but this increase is not as marked as it was during the previous month. Adverse weather conditions have retarded deliveries in many cases although orders have been fairly large. One distributor, for example, delivered 116 cars last week against orders for about 180 cars, the remainder being retained on the floor for delivery when the weather improves. Another distributor in a higher priced field delivered 84 cars out of orders for 110.

Outside of such cars as are accumulating, due to delayed deliveries, stocks on dealers' floors are normal for this time of the year. Some of the lines in which there was some delay in the factory end earlier in the year are now catching up with their orders. Dealers are trading conservatively and used car stocks, generally speaking, are not burdensome.

Sherlock & Arnold reports new registrations during the first two weeks of the month as 9976 as compared with 8550 for the corresponding two weeks of last year.

Chicago

Retail sales of new cars continued during April the record pace set in March. It is estimated that sales this month were approximately 50 per cent greater than April a year ago. Stocks of new cars are in no sense abnormal, and although used car stocks are high, they are not considered unusually so in view of the heavier volume of new cars sold. Ford demand and supply seems to be very near on a par, while new Fords in Chicago continue to sell in greater volume than other makes.

St. Louis

St. Louis, sales of new cars have increased steadily since February. Ford and Chevrolet sales, on the basis of March and February comparison, are close, both exceeding 1000 cars in March. Proportionate increases have been made this month in these cars and other lines. New car stocks are about equal to those of last April. Dealers are showing caution in buying new cars and in the trade-in allowance on used cars. Stocks of used cars are not large. Accessory sales show an increase of about 20 per cent over April of last year.

Cleveland

New car sales for the first three weeks of April are close to the record set for the full month of March. Ford business continues to lead the field by a wide margin. Used car movements were reported very brisk with dealers' stocks, both new and used, moderately low.

Philadelphia

While definite figures are not yet available, new car sales in April have run considerably higher than in the corresponding month last year. Stocks in new vehicles are pretty well down, but sustained high production at the factories is enabling dealers to make prompt deliveries in practically all models. Ford is outselling his nearest competitor, Chevrolet, by a larger margin than was the case a month ago, and it is estimated that Ford cars at present constitute 35 per cent of all automobile sales in Philadelphia. Next to Ford and Chevrolet, Hudson and Essex cars combined are making the greatest strides.

Cincinnati

Business conditions in April in Cincinnati are exceeding expectations of automobile dealers as well as allied trades. For the first 20 days in April, new car registrations showed an increase of 50 per cent over last year, and equal total registrations for last month. The used car increase is 35 per cent over last year and sales for the same period are only 18 per cent below March totals. Dealers in some cases are unable to meet demands. Inventories of both new and used cars are low, parts and accessory dealers enjoying the same conditions. General business is good and the outlook is bright, according to dealer association officials.

Milwaukee

Due largely to cold weather with late snows and considerable rainfall, passenger car sales suffered depression under last year for the first three weeks of April, but a pick-up is noticeable and dealers look for April volume to approximate last year, other conditions continuing favorable. Nothing but bad weather is held responsible for the recent let-down. Some accumulation of new car stocks is admitted, but no concern is expressed, in view of the promising immediate future. Chevrolet is trailing last year rather heavily. Ford dealers are still behind with orders.

Minneapolis

Muddy, unpaved roads are the only hindrance to retail automobile sales in the country districts. City sales are good as a rule, distributors are getting enough cars, except here and there is a shortage on deliveries of certain models, such as Auburn and Ford Tudor. Business is pronounced remarkably good with prospects for continuation. Season late here. Used cars are piling up as usual at this season and competition is found in low-priced new cars. Ford leads April deliveries in largest county of state; Chevrolet second.

Boston

Boston distributors found their stocks depleting as April started, due to many deliveries earlier than usual. Bad weather the latter part of the month slowed up sales, and deliveries at present are average. Stocks are slightly under usual requirements. Some dealers are long on certain types and short on others. Ford deliveries are better and sales continue good. New car sales for Massachusetts for the first quarter were 6624 against 13,675 last year.

(*Continued on next page*)

Accuralite Adds Piston Pin Line

Muskegon Firm to Build New Unit for Business Obtained from Thompson

MUSKEGON, MICH., April 30—With the acquisition of the entire jobbing business of the Sidney Thompson Co., Defiance, Ohio, by the Accuralite Co., this city claims to be the leading distribution center of piston rings, pistons and piston pins for the replacement trade. The local firm plans to enter at once into the production of piston pins in connection with its present operations and the new line is expected to bring gross sales in 1929 to between $750,000 and $1,000,000.

Additions in plant and equipment, costing about $50,000, are contemplated by the company to house the new department. The addition, it is said, will increase floor space by 8000 sq. ft., bringing the total to 23,400 sq. ft. The Thompson company was organized in 1925 as the replacement parts division of the Defiance Screw Machine Products Co. Increase in orders from automobile manufacturers is said to have made it necessary for the Ohio company to withdraw from the jobbing field.

The Accuralite company was organized a little more than three years ago by A. W. Lines, P. R. Beardsley and C. E. Farmer, taking over the piston business of the Muskegon Motor Specialties Co.

Taxes on Gasoline Total $305,233,842

WASHINGTON, May 4—Gasoline taxes amounting to $305,233,842 were collected on the sale of 10,178,344,771 gallons of motor fuel in 1928 in the District of Columbia and the 46 states in which the tax was effective during the whole or part of the year, according to figures compiled by the Bureau of Public Roads, Department of Agriculture.

Berry Plant Completed

DETROIT, April 29—Berry Brothers have completed a 4-story addition to their Berryloid plant in Detroit. The new structure will be utilized for the manufacture of Berryloid lacquer finishes for both automobiles and airplanes. The old plant in which Berryloid was made will be used as an addition to the Berrycroft enamel plant.

Racine Body Plant Will be Auctioned

Unit Formerly Owned by Mitchell and Hupp Appraised at $590,000

RACINE, WIS., May 1—The automobile body plant formerly owned jointly by the Mitchell Motors Co., of Racine, and the Hupp Motor Car Corp., of Detroit, more recently in the possession of the Murray Body Corp., but not operated by this interest, will be offered for sale at public auction at Racine on May 6.

The appraised value of the plant is $590,000. It has been idle several years. The plant originally was built by the Racine Mfg. Co. to build carriages, out of which grew the manufacture of enclosed automobile bodies. The former Mitchell company took it over as its source of body supply and later sold a half interest in the factory to the Hupp Motor Car Corp.

When the Hupp company contracted with Murray for its bodies, it disposed of the Racine plant to the Murray corporation. The operation was abandoned at that time. The plant site covers 12 acres and is situated only a few blocks from the heart of the Racine business district.

Higher New Car Sales Are Expected for May

(*Continued from preceding page*)

Oakland, Calif.

Northern California sales for April show a gain of nearly 15 per cent over April, 1928, but slight falling off from March of this year. This is due to frosts and slight slackening of business, and to the fact that March was 50 per cent in advance of last year. Stocks of new cars on hand are slightly heavier than a month ago, except for Fords and Chevrolets. Fords are being delivered immediately or within a week, but no stocks on hand. Chevrolet production is far behind the demand. It is claimed there are 8000 orders in California unfilled.

Los Angeles

Sales of practically all makes except Ford show a decrease in comparison with April, last year, but a gain of above 4000 units for Ford boosts the total above the mark of 1928. A selling market is present and should continue until May has ended when vacation buying will have been completed, dealers anticipating a slight drop at that time.

Used cars will furnish an aggravating problem in the Los Angeles area in the late summer if dealer and distributor anticipations prove true. This condition will arise from the dumping of large numbers of new cars in factory clean-ups in this territory.

Dealers' new car stocks remain at normal with deliveries being made immediately in nearly every model. Ford stocks are the one exception and but slight delay is necessary in that field.

Seattle, Wash.

Retail car sales in Seattle for April show a slight increase over sales for March, but are a little off compared with April of last year. Sales for the first four months of 1929 show 5 per cent increase over the same months of 1928. New car stocks are heavy at present, but dealers are anticipating heavy sales this quarter. Used car stocks are heavy, the market not having opened up as yet on account of cold weather. Ford sales are far in the lead and they are able to make deliveries promptly.

Atlanta, Ga.

Automobile sales are reported heavy by nearly all dealers and distributors. Ford sales are so heavy that dealers are unable to obtain ample stocks. Chevrolet sales also are strong. All over the southeast, Packard, Cadillac and other high-priced car dealers report sales better than last year. Medium-priced car sales equal those of last season. Some of the better dealers consider the late spring and summer outlook excellent for all types. Truck sales are about equal to last season.

Denver

April generally has been better than March. Light cars show about the same as April last year, but heavier cars are not quite so good. Middle class cars seem to be the worst sufferers. Improved weather and passing assessment date are responsible for the pickup. Agricultural sections are seriously depressed, although increasing mining activity presages improvement in truck sales within the next few months. Few repossessions in used car stocks of average company. Fords are about meeting demands, except Tudors and De Luxe coupes, which are a few days behind.

Dallas, Tex.

Unseasonal weather hampering agricultural activities is reflected in April sales. New car business is above April a year ago, but 4 per cent below the previous month, excepting Fords, which show a slight increase. Ford dealers' stocks are low, but deliveries are prompt on most models. Other dealers' stocks are slightly heavier than last month. Used car stocks are heavy with sales 6 per cent below March. Parts, accessory and equipment sales are about the same as for the preceding month.

Kansas City

Automobile sales have been spotty in April with the general trend indicating a slowing down. This condition in part is due to weather conditions, there having been much rain and cold in the month. Announcements of new lines to be placed on sale soon also have had their effect. Stocks in hands of dealers are not large for this season. Ford dealers are now making prompt deliveries with sales heavy.

New Orleans

In this section, there is a considerable advance in sales of lower-priced cars. One dealer reports a 50 per cent increase over last month's business. Used car stocks are moving rather slowly.

Men of the Industry and What They Are Doing

Diamond T Names Posts for Haskins and Huxley

C. A. Tilt, president of the Diamond T Motor Car Co., has announced the appointment of E. A. Haskins as general service manager. Mr. Haskins, a graduate automotive engineer, comes to Diamond T from the Hercules Motor Co., where he was service engineer. He has been associated with several of the larger truck manufacturers.

A new vice-presidency in the company has been created for T. C. Huxley, Jr., who continues as eastern sales manager, according to an announcement by E. J. Bush, vice-president and sales manager, for the board of directors. Mr. Huxley joined the company in 1919 as district manager on the Pacific Coast.

Allen W. Morton Marries

Miss Helen V. Michell, daughter of Mr. and Mrs. Henry F. Michell, of Philadelphia, recently was married to Allen W. Morton, president of the American Hammered Piston Ring Co. Among those attending the wedding was W. C. Stettinius, who was succeeded a few months ago by Mr. Morton as head of the Baltimore company.

Miller and Bissell Return

C. W. Miller, general manager, and R. E. Bissell, chief engineer, of Thompson Products, Inc., Cleveland, Ohio, have returned from an extended trip through principal European countries, following a study of methods, designs and materials employed by overseas manufacturers of automobile and airplane parts.

Coughlin Heads Project

Charles L. Coughlin, vice-president and general manager of the Briggs & Stratton Corp., and president of the Evinrude Motors Co., Milwaukee, heads a group of Milwaukee, Detroit and Iron Mountain (Mich.) manufacturers who have acquired a 57 per cent interest in the Lake Shore Engine Works of Marquette, Mich., from the Longyear estate.

Walker Returns From Trip

Helm Walker, vice-president in charge of sales of the Windsor Corp., just returned from extensive trip through the eastern territory, visiting Chicago, Philadelphia, Pittsburgh, New York and Boston. Walker reports Windsor dealers' stocks are extremely low.

Black and Rowe Return

R. D. Black, advertising manager, and W. A. Rowe, production manager, of the Black & Decker Mfg. Co., Towson, Md., have returned from Europe. They spent several months at the factory of Black & Decker, Ltd., Slough, Bucks, England, and included in their trip a visit to the Leipzig Fair, at which the Black & Decker company had an exhibit.

Dr. Fritz von Opel (right), chief engineer of the Opel Works, Russelsheim, Germany, and Gotthelf Paulus, assistant chief engineer, were photographed with Cady B. Durham (middle) during one of their recent visits among General Motors plants. The resignation of Mr. Durham, as vice-president of the Buick Motor Co., to join the staff of Alfred P. Sloan, Jr., was announced in Automotive Industries last week.

Executives of Opel Works Visit General Motors Plants

Bailey Moves to Lansing

The office of W. J. Bailey, director of traffic of Durant Motors, Inc., has been moved from the plant at Elizabeth, N. J., to the plant at Lansing, Mich. From Lansing Mr. Bailey will direct the traffic of the Durant plants in Lansing, Elizabeth, Oakland and Toronto and of the Durant controlled unit manufacturing plants in Syracuse, N. Y., and Muncie, Ind.

Moth Elects Hoyt

Richard F. Hoyt, chairman of the board of Wright Aeronautical Corp. and of a number of other aircraft manufacturing concerns, has been elected to a similar post with the Moth Aircraft Corp.

United Motors Names Lane

Fred A. Oberheu, for the past 10 years sales manager of the United Motors Service, Inc., has been appointed vice-president and director of sales, according to announcement by Ralph S. Lane, president.

Wallace Joins Chrysler

D. A. Wallace, for 10 years associated with the John Deere Tractor Co., Waterloo, Iowa, resigned May 1, to become associated with the executive staff of the Chrysler Motors Corp.

Lowenstein on Trip

V. J. Lowenstein, sales manager, Carter Carburetor Corp., sailed for an extended European business trip.

Segrave is Knighted

The man who established the world's automobile speed record of 231.36246 m.p.h. at Daytona Beach, Fla., on March 11, is now Sir Henry Segrave. The accolade of knighthood was conferred upon him by King George at Craigweil House, near Bognor, recently in honor of his racing achievement.

Brisson to Enter Stutz

E. H. Brisson, Argentine sportsman who took second with his stock Blackhawk in the annual 24-hr. road race at LeMans, France, last year, has purchased another Stutz for competition in the 1929 French classic.

Aubinger Goes to California

H. A. Aubinger, eastern district manager of the Burgess-Norton-Dall Corp., Geneva, Ill., has gone to California in the interest of the business and his health. W. F. Decker, Brooklyn branch manager, will handle the eastern territory during Mr. Aubinger's absence.

Hook Names Harding

R. W. Hook, president of the Grand Rapids Metalcraft Corp., announces the appointment of J. V. (Jack) Harding as sales manager of the Kelch Heater division of the corporation. Mr. Harding has had wide experience in the automotive equipment field.

A.C.C. Names Henderson

C. W. Henderson, who directed the 1928 Los Angeles National Air Races and Aeronautical Exposition, has been appointed manager of the aircraft show section of the Aeronautical Chamber of Commerce.

Studebaker Profit Reaches $4,605,057

Erskine Reports Earnings of $2.36 Per Share as Highest Since 1923

SOUTH BEND, April 30—The Studebaker Corp. of America reports net profit for the first quarter of 1929 after all charges, including increased reserves for depreciation and reserves for income taxes, but before preferred dividends, as $4,605,057. This compares with $3,979,873 for the corresponding quarter of 1928, an increase of over 15 per cent, A. R. Erskine, president, announced today.

Profits, after dividends on preferred stock, equal $2.36 per share on the 1,893,750 shares of common stock outstanding at the end of the period, compared with $2.05 per share on the 1,875,000 shares outstanding at the end of the first quarter in 1928. These earnings are the largest of any first quarter in the company's history with the exception of 1923, Mr. Erskine stated.

Net sales for the period were $37,738,915 on 30,028 cars against $38,654,315 on 34,690 cars for the 1928 initial quarter. Through concentration of efforts on the President and Commander models, sales of these higher priced jobs increased over 59 per cent, and the ratio of net profits to sales for all lines rose to 12.2 per cent from 10.3 per cent last year.

Wilcox-Rich Reports Net for Quarter as $484,451

DETROIT, April 30—The Wilcox-Rich Corp. reports net earnings for the first quarter as $484,451, or nearly double those for the corresponding period of last year, $258,960. These figures for the first time reflect the combined operations of Wilcox Products, Rich Products and Rich Tool, while the earnings for the first quarter of last year, as reported, combined the earnings of each of the three units operating separately.

According to C. H. L. Flinterman, president, growth of the aviation business as well as the high rate of operations in the automotive lines, has contributed substantially to the corporation's business thus far in 1929.

Isotta Stock Increased

NEW YORK, April 30—Directors of Isotta-Fraschini, manufacturers of automobiles and aircraft motors in Italy, have authorized a 20 per cent stock allotment by raising the outstanding stock from 375,000 to 450,000 shares of par value 200 lira. The 75,000 additional shares were offered to shareholders at 210 lira on the basis of one new share for each five held. The new stock carries dividend from January 1, 1929, payable next year, dividends being payable annually.

Financial Notes

Whittelsey Mfg. Co. of Bridgeport, Conn., licensed for the American manufacture and sale of the British Avro Avian sport and training airplane, has completed its plans for financing which include the offering of 200,000 shares of Class A convertible common stock for public subscription. The product of this company will be known as Whittelsey Avian and is a replica of the British Avro Avian, named after its designer, A. V. Roe.

E. I. du Pont de Nemours & Co. reports net income for the first quarter of the current year as $23,847,677, or $2.42 a share. This compares with $20,304,487, or $2.18 a share, for the first three months of last year. Net income from operation and investments for the three months was $25,239,845 as compared with $21,514,198 last year. Income from the company's General Motors investments was $17,466,131 as compared with $14,974,930 a year ago.

Minneapolis Steel & Machinery Co., has approved plans to increase the common stock from 150,000 to 160,000 shares, endorsing the proposed merger with the Minneapolis Threshing Machine Co. of Hopkins and the Moline Implement Co. Directors of the other companies will meet soon to act on the merger.

Michigan Steel Corp. reports net earnings of $587,333 for the quarter ended March 31, equivalent to $2.67 a share on the 220,000 shares of common stock outstanding. Based on orders on hand the second quarter is expected to exceed the showing of the first quarter of this year.

Wright Aeronautical Corp. reports net profit for the first quarter of the current year after all charges as $533,925. This is equivalent to $1.78 a share on no par common stock and compares with $470,897, or $1.88 a share, on outstanding stock at the end of the first quarter last year.

General Electric Co. reports net profit for the first quarter, available for common stock, as $13,862,298. This is equivalent to $1.92 a share and compares with profit for the corresponding quarter of last year of $11,261,842, or $1.56 a share.

Yellow Truck & Coach Mfg. Co. reports a net profit before provision for depreciation for the first quarter, of $349,866 and after provision for depression $58,852. Net sales for the quarter, according to President Paul W. Seiler, were $12,921,999.

Federal Screw Works report a net profit of $340,603 for the fiscal year ended Dec. 31. Net profits for the first quarter of 1929 total $317,393 compared with $97,602 in the first quarter of last year.

Borg-Warner Corp. reports net profits for the first quarter of the current year as $1,851,993, a new high record equal to $3 a share on common stock.

Federal-Mogul Corp. reports net earnings for the first quarter, 1929, as $131,323, after all charges and taxes. This is equivalent to more than $1 per share on 130,000 shares of outstanding stock. The inventory is low and has been turned over at the rate of 10 times a year against an average of five times in Federal's line of business. The firm has moved into an addition to its plant and is starting construction of another addition to handle increasing business. Advance bookings indicate a record volume of business for 1929, it is reported.

Bower Roller Bearing Co. stockholders have approved the directors' proposal to increase the authorized capital stock from 160,000 shares to 250,000 shares. Of this increase, 80,000 shares will be distributed to stockholders, each shareholder of record May 7 receiving rights to subscribe to one share of new stock at $6. Rights expire May 28. Funds received will defray expenses in expanding plants and equipment.

Melling Forging Co., of Lansing, reports net profits of $54,678, for the first quarter. The company spent $35,000 during the quarter for plant expansion. Current assets are $384,319, of which $96,402 is cash. Current liabilities are $152,905, leaving net working capital of $231,413.

Stewart-Warner Speedometer Corp. and subsidiaries report net profit after all charges for the quarter ended March 31 as $2,054,224, equivalent to $3.42 a share on outstanding common stock. This compares with $2,275,557, or $3.79 a share, for the preceding quarter and with $1,387,284, or $2.31 a share, for the first quarter of 1928.

American Bosch Magneto Corp. reports net profit after all charges for the first quarter of the current year of $223,192. This is equivalent to $1.07 a share on outstanding stock and compares with $71,276 for the corresponding quarter of 1928 before Federal taxes, or the equivalent of 34 cents a share.

Curtiss Aeroplane & Motor Co. reports net profit for the quarter ended March 31 of $368,237 after all charges. This is equivalent to $1.10 a share on outstanding stock and compares with $190,122, or 54 cents a share, figured on a comparable basis for the corresponding quarter of 1928.

Motor Wheel Corp. and subsidiaries report net profit after all charges for the first quarter of the current year of $1,108,803. This is equivalent to $1.66 a share on common stock and compares with $561,644, or $1.02 a share, for the corresponding quarter of 1928.

Commercial Credit Companies report consolidated net income applicable to common stock for the first quarter as $1,006,706. This is equivalent to an annual rate of $3.79 a share and compares with $568,471, or an annual rate of $2.50 a share, for the corresponding quarter in 1928.

Reo Motor Car Co. reports net profit after all charges for the quarter ended March 31, of $537,514, or 26 cents a share on outstanding $10 par stock. This compares with net loss of $86,489 for the corresponding quarter a year ago.

White Motor Co. reports regular quarterly dividend of 25 cents payable June 29 to stockholders of record June 12.

Caterpillar Tractor Corp. has declared quarterly dividend of 75 cents payable May 25 to stockholders of record May 15.

Boeing to Build Plant in Canada

VANCOUVER, B. C., April 30—Boeing Aircraft of Canada, Ltd., has acquired the Hoffar-Beeching Shipyards here preparatory to starting an airplane factory, according to an announcement by W. E. Boeing, of Seattle, chairman of the board of the three American Boeing Companies. The company proposes to increase the floor space at the shipyards from 30,000 to 60,000 sq. ft. Initial production, it is expected, will start on six-seat B-1E flying boats. It is expected that the manufacturing will be expanded later to include production of land planes.

The acquisition of the shipyards is being handled through an exchange of stock. It is expected that W. E. Boeing will be chairman of the board of the Canadian Boeing company, which is presently to be incorporated, and that the directorate will include several British Columbia business men as well as H. S. Hoffar and C. G. Beeching and representatives of the Boeing Airplane Co.

The Hoffar-Beeching Shipyards have been engaged in the construction of commercial vessels and yachts for 21 years and are reputed to be the largest concern in a small boat trade on the Pacific Coast.

Counterbore Firm Expands

DETROIT, April 30—The Eclipse Counterbore Co. has broken ground for a 2-story addition to its factory here. The company offices will occupy the second floor of the new building, releasing present office space and the first floor of the new building for manufacturing purposes. Additional machinery has been ordered and the new office space will be ready June 1 with the additional manufacturing space ready two or three weeks later.

New Order Covers Imports to Peru

WASHINGTON, May 2—Importers of automobiles, trucks and buses into Peru are now required to fill out special printed forms giving a description of each vehicle imported, according to a report received this week by the Department of Commerce. The new forms must be presented with other clearance papers upon making request to the customs house for withdrawal of imported vehicles, the report adds.

Opens Canadian Factory

OSHAWA, ONT., April 30—The Wallace Aircraft Company, Rockford, Ill., has announced the organization of a Canadian branch factory at Stratford, Ont., with Thomas A. Terry, formerly of London, Ont., as president of the Canadian company. A new factory building at Stratford is ready for occupation and the assembly of 20 monoplanes is being started.

Ruxton Price $4,200

The new front-wheel drive Ruxton will have a base factory price of $4,200. In the announcement of this new car in *Automotive Industries* last week, the price appeared as $3,200.

Brown Instrument to Build Addition

PHILADELPHIA, May 1—The Brown Instrument Co., of this city, announces that it will demolish immediately a one-story wing of its plant and will erect a two-story and basement building on the site. A new central wing of two stories and basement also will be constructed. The cost of the new buildings will be approximately $200,000.

The additions will increase the floor space of the plant about 50 per cent, providing larger facilities for receiving, shipping and handling material and affording more room for manufacturing and research. This project will be the fourth addition to the Brown Instrument plant in eight years. Less than a year ago the company completed the construction of a two-story addition, but the continued growth of its business has necessitated further expansion. The Ballinger Co., Philadelphia, are the architects and engineers in the present project.

A.S.M.E. Program Completed

NEW YORK, April 29—The four-day meeting of the American Society of Mechanical Engineers at Rochester, May 13 to 16, will include a paper on Diamonds as Metal-Cutting Tools, by C. L. Bausch, and another on Tungsten Carbide Cutting Alloys, by W. O. Eddy, Jr., on May 14. The following day's program includes a paper on Thread Form of Milled Worms, by Earle Buckingham, and another on Large Spiral Bevel and Hypoid Gears, by A. H. Candee. The fourth day's meeting will include a paper by J. K. Wood on New Type of Air Spring.

Calendar of Coming Events

SHOWS

Barcelona Automobile Show.....May 1-11
Melbourne Automobile Show.....May 2-11
International Aircraft Exhibition, Olympia, London .....July 16-27
International Aircraft Exhibit, Coliseum, Chicago .....Sept. 7-15
Paris, Automobiles .....Oct. 3-13
London, Automobiles .....Oct. 17-26
Prague, Automobiles .....Oct. 23-30
Paris, Motorcycles .....Oct. 23-Nov. 3
M.&E.A. Show and Convention, Chicago .....Nov. 4-9
N.S.P.A. Show and Convention, Detroit .....Nov. 11-16
Berlin Auto Salon .....Nov. 14
London, Trucks .....Nov. 7-16
Paris, Trucks .....Nov. 14-24
London, Motorcycles .....Nov. 30-Dec. 7
Brussels Auto Salon .....Dec. 7

CONVENTIONS

American Management Association, New York .....May 6-11
National Safety Congress Meeting, Detroit .....May 7-9
National Highway Traffic Association, Hotel Stevens, Chicago.....May 13-15
A.S.M.E. Meeting, Rochester, N. Y. May 13-16
First Annual Convention of Airport Section, National Aeronautical Chamber of Commerce, Cleveland .....May 15-16
National Hardware Association (Metal Branch) Annual Meeting, Detroit, May 16-17
American Gear Manufacturers' Association, Annual Meeting, Hotel Statler, Cleveland .....May 16-18
A.S.M.E. Aeronautic Meeting, St. Louis, May 27-30
Joint Meeting, Oil and Gas Power Division of the American Society of Mechanical Engineers and Pennsylvania State College, State College, Pa. .....June 24-27
American Society Testing Materials, Annual Meeting, Atlantic City, June 24-28
American Welding Society, Fall Meeting and Exposition, Cleveland....Sept. 9-12
American Institute of Mining and Metallurgical Engineers, Cleveland, Sept. 9-12
American Society for Steel Treating, Convention and Exposition, Cleveland .....Sept. 9-13
A.S.M.E.—Iron and Steel Division—National Meeting, Cleveland...Sept. 11-13
Society for Electrical Development, New York City.....Sept. 13
Eastern States Exposition, Springfield, Mass. .....Sept. 15-21
National Machine Tool Builders' Association, Cleveland.....Sept. 30-Oct. 4
National Safety Congress, Annual, Chicago .....Sept. 30-Oct. 4
Society of Industrial Engineers, Detroit .....Oct. 16-18
World Engineering Congress, Tokio, Japan .....Oct. 29-Nov. 22

RACES

Akron .....May 12
Gardner Trophy (Aircraft), St. Louis, May 28-30
Indianapolis .....May 30
Detroit .....June 9
Altoona, Pa. .....June 15
Rudge Whitworth Cup, Le Mans, June 15-16
Salem, N. H. .....June 29
French Grand Prix .....June 30
Akron .....Aug. 18
National Air Races and Show, Cleveland, Aug. 24-Sept. 2
Syracuse .....Aug. 31
Altoona, Pa. .....Sept. 2
Cleveland .....Sept. 15
Salem, N. H. .....Oct. 12

S. A. E.

Summer Meeting, Saranac Lake..June 25-28
Aeronautic Meeting, Cleveland..Aug. 26-28
Production Meeting, Cleveland.....Oct. 2-4

Sectional

Chicago	May	7
Pennsylvania	"	8
Milwaukee	"	8
Canadian	"	8
Northern California	"	9
Southern "	"	10
Cleveland	"	13
Detroit	"	13
Dayton	"	14
Northwest	"	18
Indiana	"	18
New England	"	22
Metropolitan	"	23